SANYO VHR-171G

MODEL

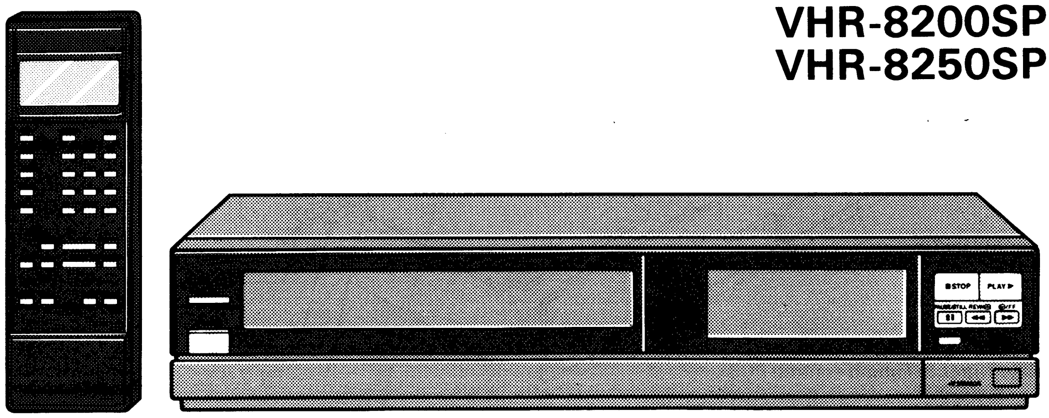
SERVICE MANUAL + VHR7100G

SANYO

# Service Manual

# Video Cassette Recorder

# VHR-7100 series
# VHR-7200 series
# VHR-7250 series
# VHR-7300 series
# VHR-8070 series
# VHR-8100SP
# VHR-8200SP
# VHR-8250SP



VHR-7200E

VHS PAL HQ

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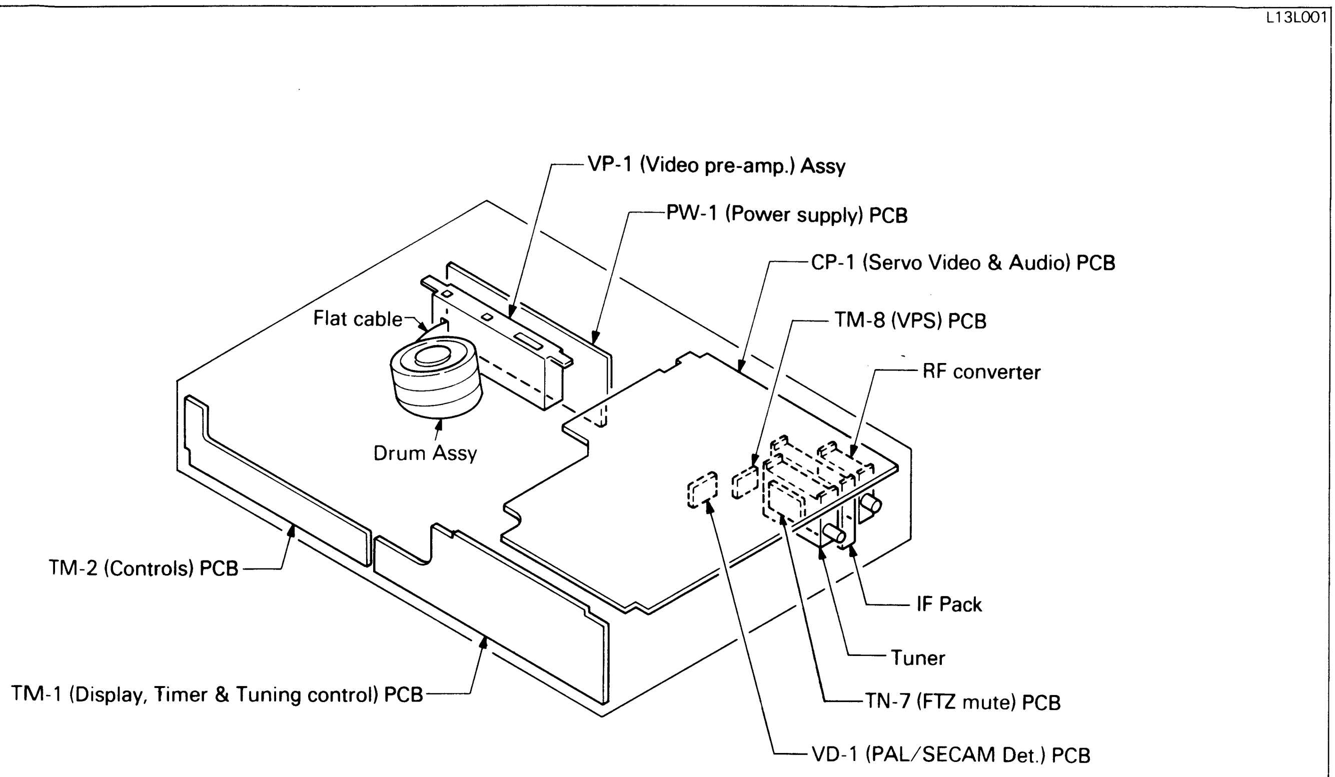
RP1, RP1L,RP2 series

REFERENCE No. WM530606

# 1. CIRCUIT BOARD LOCATIONS

## 1-1. MAIN BOARDS


L13L001
VP-1 (Video pre-amp.) Assy
PW-1 (Power supply) PCB
CP-1 (Servo Video & Audio) PCB
TM-8 (VPS) PCB
RF converter
Flat cable
Drum Assy
TM-2 (Controls) PCB
TM-1 (Display, Timer & Tuning control) PCB
IF Pack
Tuner
TN-7 (FTZ mute) PCB
VD-1 (PAL/SECAM Det.) PCB

* VD-1 (PAL/SECAM Det.) PCB is installed on VHR-7100 series, -7200G, -7200EX and -7300G only.
** TM-8 (VPS)PCB is installed on VHR-7100G, -7200G and -7300G only.

Fig. 1-1

## 1-2. LOCATION FOR TAPE PATH ADJUSTMENT

NOTE: Test point TP182 and TP183 for tape path adjustment is shown in figure below.
For adjustment, refer to the separate volume "Mechanism Service Technical Information".

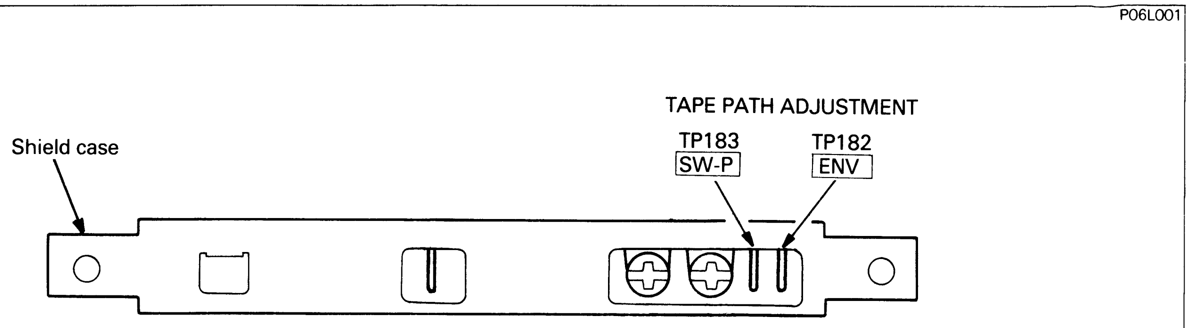

P06L001
TAPE PATH ADJUSTMENT
Shield case
TP183
SW-P
TP182
ENV

Fig. 1-2 Pre-amp Unit

# 2. ELECTRICAL ADJUSTMENT

## 2-1. PREPARATION

### 2-1-1. EQUIPMENT

- Colour TV monitor
- PAL Colour-bar generator (with RF and LINE OUTPUT)
- Audio signal generator
- Oscilloscope (dual trace; frequency response: 10MHz or more; probe: 10:1)
- Frequency counter (countable to 10MHz or higher)
- Digital voltmeter
- AC voltmeter
- In/output probes
- Alignment cassette (VHJ-0008) PAL Colour bar 1KHz
- Alignment cassette (VHJ-0009) Monoscope 6KHz
- Alignment cassette (VHJ-0051) Check for D.O.C.
- Alignment cassette (VHJ-0023) PAL Monoscope 6KHz, PAL Colour-bar 1KHz, SECAM Colour-bar 1KHz, PAL RF Sweep MESECAM Colour-bar 1KHz, NTSC Colour-bar 1KHz.
- Relay jig (VHJ-0065) 5-wire cable for Pre-amp unit
  Connect the Flat cable end from the Drum assembly to the Pre-amp unit using the Relay jig to provide simple repairing and adjustment of the Pre-amp unit, as shown in Fig. 2-1-1. Further, when andjusting the Pre-amp unit, be sure to make contact an end of Shield case with Bracket of the Pre-amp unit to maintain the shield effect.
- Extension relay jig (VHJ-0079) for CP-1 PCB
  Connect between the CP-1 and TM-1 PCB using the Extension relay jig to provide simple repairing and adjustment of the CP-1 PCB, as shown in Fig. 2-1-2. Correctly, connect the Connector from CN304 on the CP-1 PCB to CN005 of the Relay jig, and that from CN001 of the Relay jig to CN711 of the TM-1 PCB. The connector from CN002 of the Relay jig is not required connect.

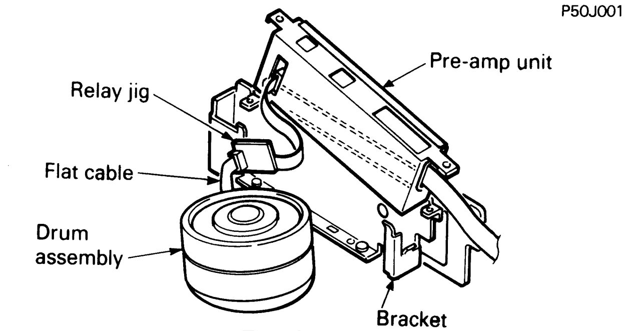

P50J001
Pre-amp unit
Relay jig
Flat cable
Drum assembly
Bracket

Fig. 2-1-1

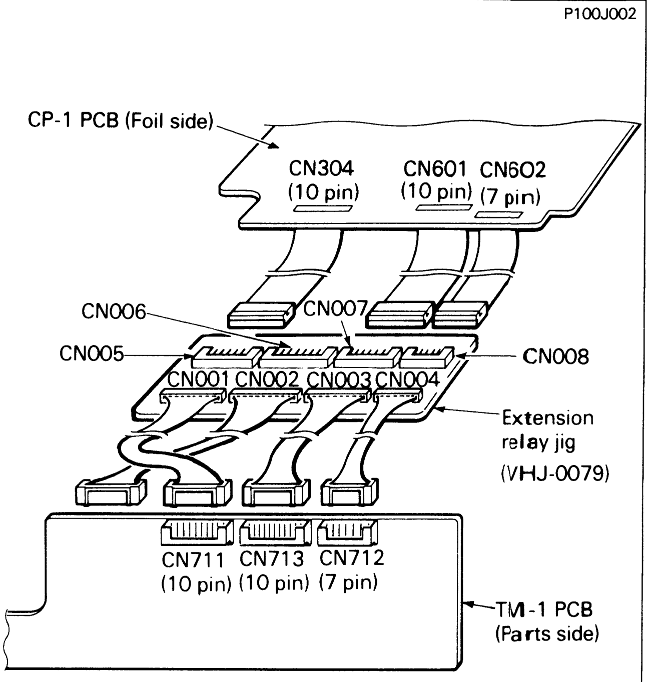

P100J002
CP-1 PCB (Foil side)
CN304 (10 pin)
CN601 (10 pin)
CN602 (7 pin)
CN006
CN007
CN005
CN008
CN001
CN002
CN003
CN004
Extension relay jig (VHJ-0079)
CN711 (10 pin)
CN713 (10 pin)
CN712 (7 pin)
TM-1 PCB (Parts side)

Fig. 2-1-2

### 2-1-2. SET-UP

Because the RF input signal is used for circuit adjustments, connect the colour-bar generator to the ANT IN terminal of the VCR. The RF input signal is processed by the tuner and IF circuit. It is important that the video output signal of the IF circuit satisfies the items shown in Fig. 2-1-3. Connect the oscilloscope to the VIDEO OUTPUT terminal of the video circuit and terminal with a 75Ω load, and then check the video output signal.

- The amplitude of the sync signal should be approximately 0.3 Vp-p.
- The amplitude of the video signal should be approximately 0.7 Vp-p.
- While observing the oscilloscope or TV screen, make fine-tuning adjustments so that the colour burst amplitude is approximately 0.3 Vp-p.
- Check to be sure that there is no spike noise in the sync part of the horizontal sync signal.

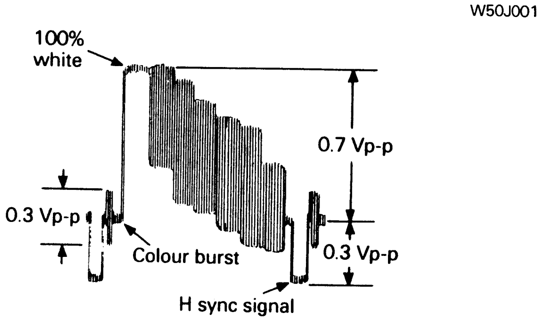
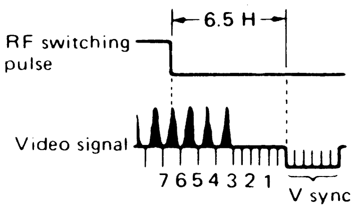

W50J001
100% white
0.7 Vp-p
0.3 Vp-p
Colour burst
0.3 Vp-p
H sync signal

Fig. 2-1-3

## 2-2. SERVO CIRCUIT ADJUSTMENT ..... CP-1 PCB

NOTE (1) : These adjustments should be carried out upon completion of the transport adjustments.
(2) : If the tape transport adjustments are carried out after these adjustments, follow the procedures again in SWITCHING POSITIONS.

| No. | Item | Input | Mode | Point | Location | Remark |
|---|---|---|---|---|---|---|
| 1 | SWITCHING POSITION | Alignment cassette (VHJ-0009 or VHJ-0023) | PLAY | VIDEO OUTPUT TP101<br>RF SW pulse TP351 | VR351 | W25S002<br> 6.5 H<br>RF switching pulse<br>Video signal<br>7 6 5 4 3 2 1<br>V sync<br>1. Press the tracking control (+) (–) buttons simultaneously to the center position (on the display "T —:— ").<br>2. Adjust VR351 so that the phase of the leading edge of the vertical sync signal is delayed 6.5 ± 0.5 H from the fall of the RF switching pulse waveform. |
| 2 | STILL V-LOCK | Colour bar from Colour bar generator | REC<br>↓<br>PLAY<br>↓<br>STILL | TV screen | VR361<br>Rear panel | 1. Put the VCR in the REC mode and record at the middle of the cassette tape.<br>2. Playback the recorded part, and put the VCR in the STILL mode.<br>3. Adjust VR361 so that the V jitter (very fine movement of the vertical sync) is minimized. |

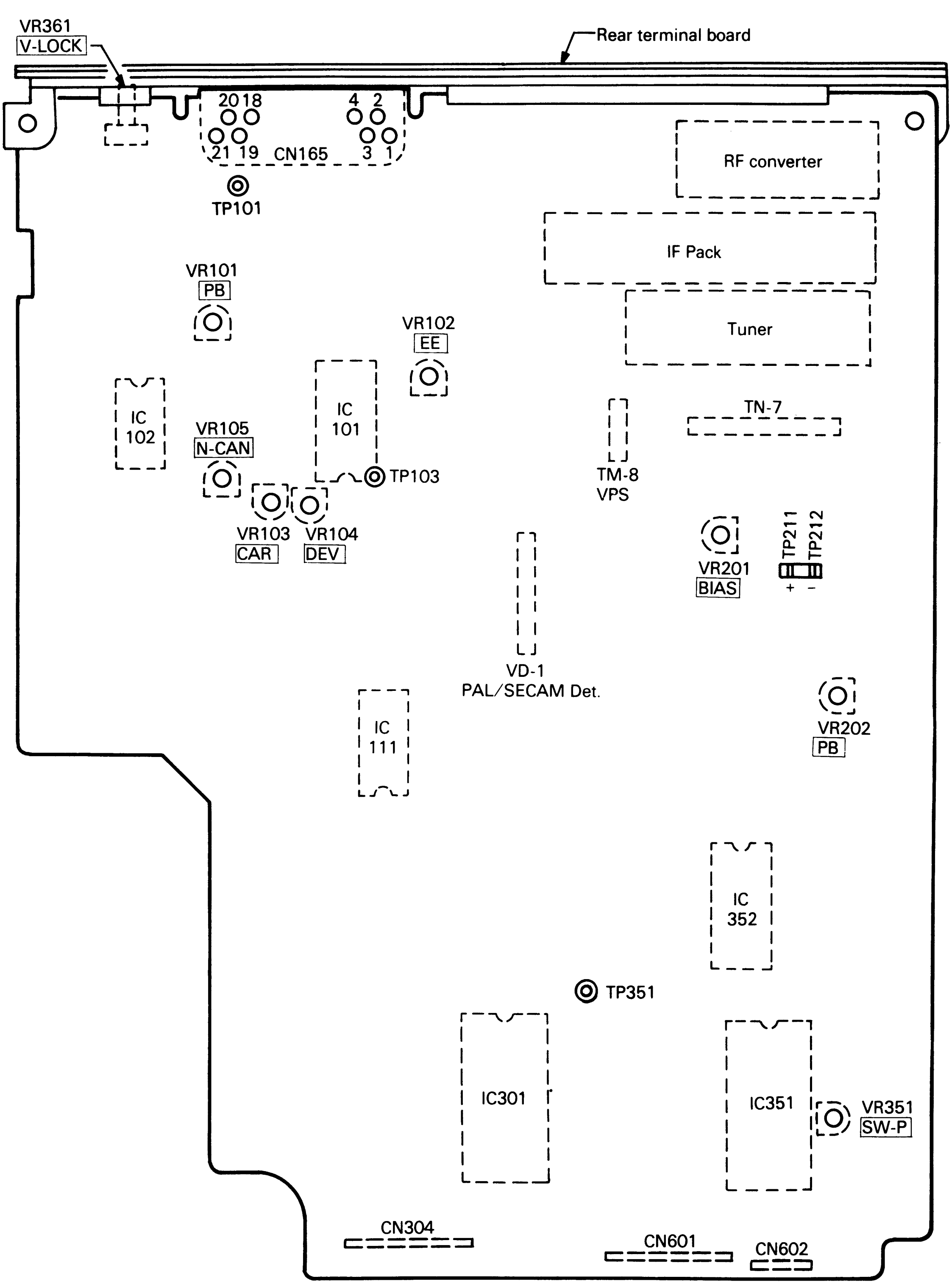
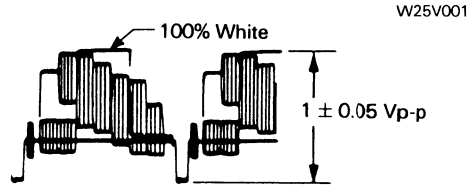
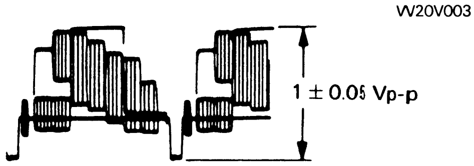
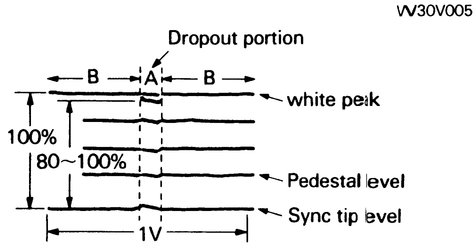
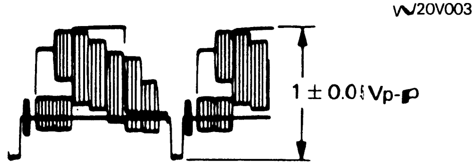
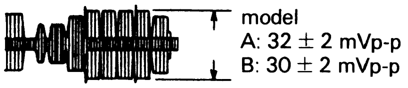
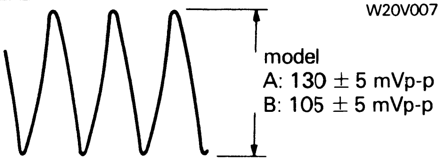

P22S001
VR361
V-LOCK
Rear terminal board
20 18
4 2
21 19
CN165
3 1
TP101
RF converter
IF Pack
Tuner
VR101
PB
VR102
EE
IC 102
IC 101
VR105
N-CAN
TP103
TN-7
TM-8
VPS
VR103
CAR
VR104
DEV
VR201
BIAS
TP211
TP212
+
-
VD-1
PAL/SECAM Det.
IC 111
VR202
PB
IC 352
TP351
IC301
IC351
VR351
SW-P
CN304
CN601
CN602

Fig. 2-2-1 CP-1 PCB (Foil side view)

## 2-3. VIDEO CIRCUIT ADJUSTMENT ... CP-1 PCB and VP-1 Assy

NOTE (1) : When adjustment No. 1, No. 2 and No. 5 below, terminate VIDEO OUTPUT TP101 at 75 ohms.
(2) : Adjustment No. 3 below, should be performed after stabilizing the circuit operation. (At least 5 minutes after VCR power on.)
(3) : 'No-signal REC mode' is not to supply any signal to VIDEO INPUT terminal.
(4) : Use the Relay jig mentiond in the 2-1. PREPARATION to provide easy adjustment of the Pre-amp unit.

| No. | Item | Input | Mode | Point | Location | Remark |
|---|---|---|---|---|---|---|
| 1 | E-E LEVEL | Colour bar (100% white level) from Colour bar generator | E-E | VIDEO OUTPUT TP101 (CP-1 PCB) | VR102 |  <br>1. Adjust VR102 so that the level is 1.00 ± 0.05 Vp-p. |
| 2 | PB-Y LEVEL | Alignment cassette (VHJ-0008 or VHJ-0023) | PLAY | VIDEO OUTPUT TP101 (CP-1 PCB) | VR101 |  <br>1. Adjust VR101 so that the level is 1.00 ± 0.05 Vp-p. |
| 3 | N-CAN LEVEL | Alignment cassette (VHJ-0051) | PLAY | VIDEO OUTPUT TP101 (CP-1 PCB) | VR105 |  W30V005<br>Dropout portion<br>B<br>A<br>B<br>white peak<br>100%<br>80~100%<br>Pedestal level<br>Sync tip level<br>1V<br>1. Set the horizontal scale (TIME/DIV) of the oscilloscope to 1 msec./div.<br>2. Adjust VR105 so that the white peak level at drop out portion "A" becomes 85 ~ 100% for the white peak level of no drop out portion "B". |
| 4 | CARRIER SET | No-signal | REC | TP103 (CP-1 PCB) | VR103 | 1. Set the channel selector buttons to the AV position and put the VCR in the no-signal REC mode.<br>2. Adjust VR103 so that the frequency is 3.80 ± 0.05 MHz. |
| 5 | DEVIATION | Colour bar (100% white level) from Colour bar generator | REC (Adjust-ment) ↓ PLAY (Check) | VIDEO OUTPUT TP101 (CP-1 PCB) | VR104 |  <br>1. Insert the blank tape to the VCR and record colour bar signal.<br>2. Playback the recorded part, and check that the level is 1.00 ± 0.05 Vp-p.<br>3. Repeat adjust VR104 before the record, and the playback it, if not satisfactory. |

| No. | Item | Input | Mode | Point | Location | Remark |
|---|---|---|---|---|---|---|
| 6 | C REC CURRENT | Colour bar from Colour bar generator | REC | TP181 (HOT)<br>shield case (GND)<br>(Pre-amp) | VR181 | W15V006<br> <br>1. Rotate VR182 so that the luminance level is minimize.<br>2. Adjust VR181 so that the level (model: mark A) is 32 ± 2 mVp-p, and also that the level (model: mark B) is 30 ± 2 mVp-p. |
| 7 | Y REC CURRENT | No-signal | REC | TP181 (HOT)<br>shield case (GND)<br>(Pre-amp) | VR182 | W20V007<br> <br>1. Set the channel selector buttons to AV position and put the VCR in the no-signal REC mode.<br>2. Adjust VR182 so that the level (model: mark A) is 130 ± 5 mVp-p, and also that the level (model: mark B) is 105 ± 5 mVp-p.<br>3. Follows are the applicable models and their corresponding mark. |

## Comparsion chart of Models and Marks

| Model | Mark |
|---|---|
| VHR-7100 series, VHR-7200 series, VHR-7300 series, VHR-8070 series, VHR-8100SP, VHR-8200SP | A |
| VHR-7250 series, VHR-8250SP | B |

P60V001

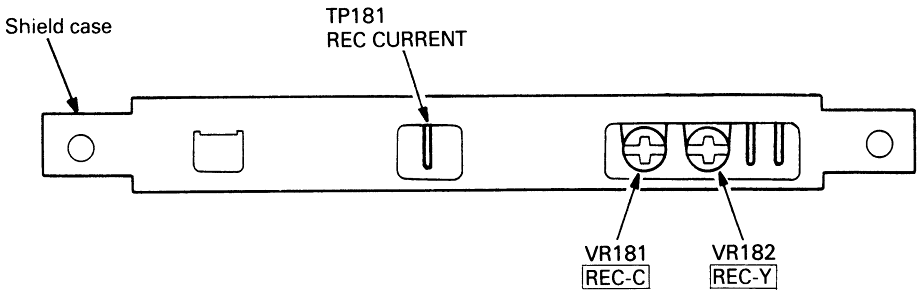


Fig. 2-3-1 Pre-amp Unit

## 2-4. AUDIO CIRCUIT ADJUSTMENT ... CP-1 PCB

NOTE (1): 'No-signal record mode' is not to supply any signal to AUDIO INPUT terminal.
NOTE (2): Item No. 2 apply to the model that equipped with 21 pin SCART on the rear terminal board.
NOTE (3): Item No. 3 apply to the model that equipped with RCA pin jack on the rear terminal board.

| No. | Item | Input | Mode | Point | Location | Remark |
|---|---|---|---|---|---|---|
| 1 | BIAS LEVEL | No-signal | REC | TP211<br>TP212 (GND) | VR201 | 1. Set the channel selector buttons to the AV position and put the VCR in the no-signal REC mode.<br>2. Adjust VR201 so that the level is 20 mVrms. |
| 2 | REC/PB OUTPUT LEVEL | Audio signal (1 KHz, −3.8 dBm) from Audio signal generator | REC ↓ PLAY | AUDIO OUTPUT CN165 pin 1 | VR202 | 1. Adjust VR202 so that the recorded 1 KHz output level becomes −3.8 dBm in the PLAY mode. |
| 3 | REC/PB OUTPUT LEVEL | Audio signal (1 KHz, −8 dBm) from Audio signal generator | REC ↓ PLAY | AUDIO OUTPUT terminal | VR202 | 1. Adjust VR202 so that the recorded 1 KHz output level becomes −8 dBm in the PLAY mode. |

## 2-5. TUNER IF CIRCUIT ADJUSTMENT ... IF Pack

NOTE: When performing the adjustment for the type B model, be sure to remove the rear terminal board fro CP-1 PCB (see Fig. 2-2-1 on page 4).

| No. | Item | Input | Mode | Point | Location | Remark |
|---|---|---|---|---|---|---|
| 1 | RF AGC | TV broadcast | E-E | TV screen | VR611 | 1. Turn VR611 in the direction which causes snow to appear, then in the opposite direction until the snow just disappears. |

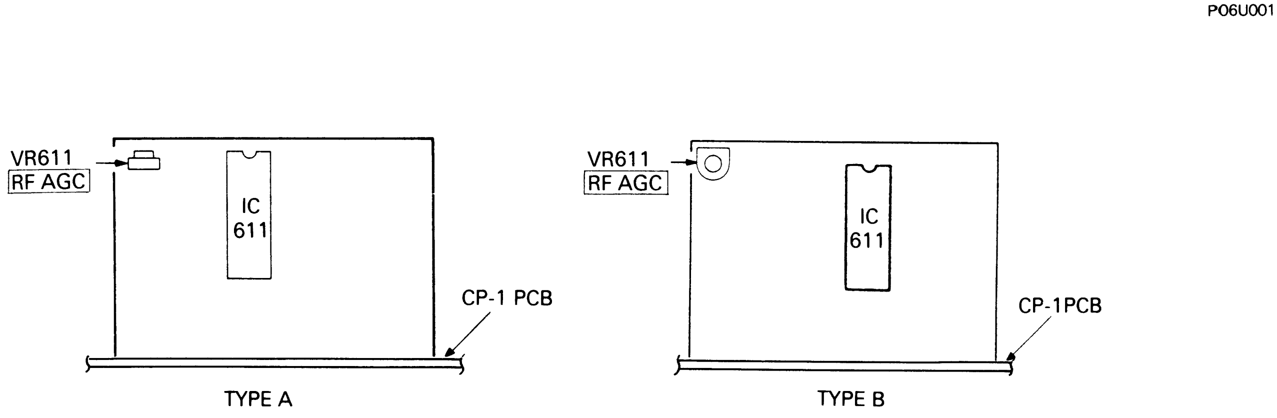


Fig. 2-5-1 IF Pack (Parts side view)

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SANYO Electric Co., Ltd.
Osaka, Japan

Mar./'90/6800 HA Printed in Japan

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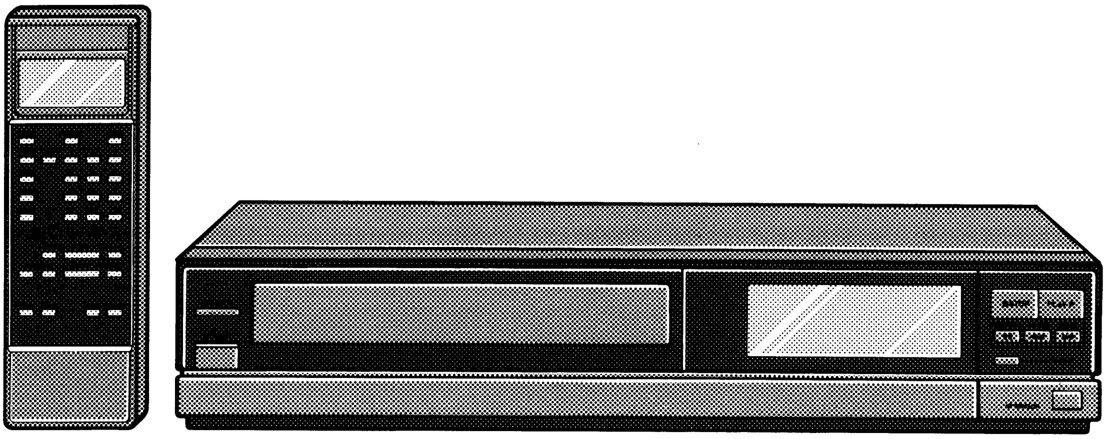
# Service Technical Information

## Color Video Cassette Recorder

VHR-7100 VHR-7200
VHR-7250 VHR-7080
VHR-7300 (Areas are listed below)
VHR-8100 VHR-8200
VHR-8250 (Spain)
VHR-8070 (Portugal)
**VHR-7080 — VHR-7300 areas.**
(Europe, East Europe, U.S.S.R, Middle & Near East, South Africa, South East Asia, Hong Kong, China, Australia, New Zealand)



VHS HQ
PAL

## Basic Circuit Description

### Contents

1. OUTLINE OF VHS PAL FORMAT ··········· 1
2. SYSTEM CONTROL CIRCUIT ················ 6
3. SERVO CIRCUIT ································· 18
4. VIDEO CIRCUIT ································· 38
5. AUDIO CIRCUIT ································· 66

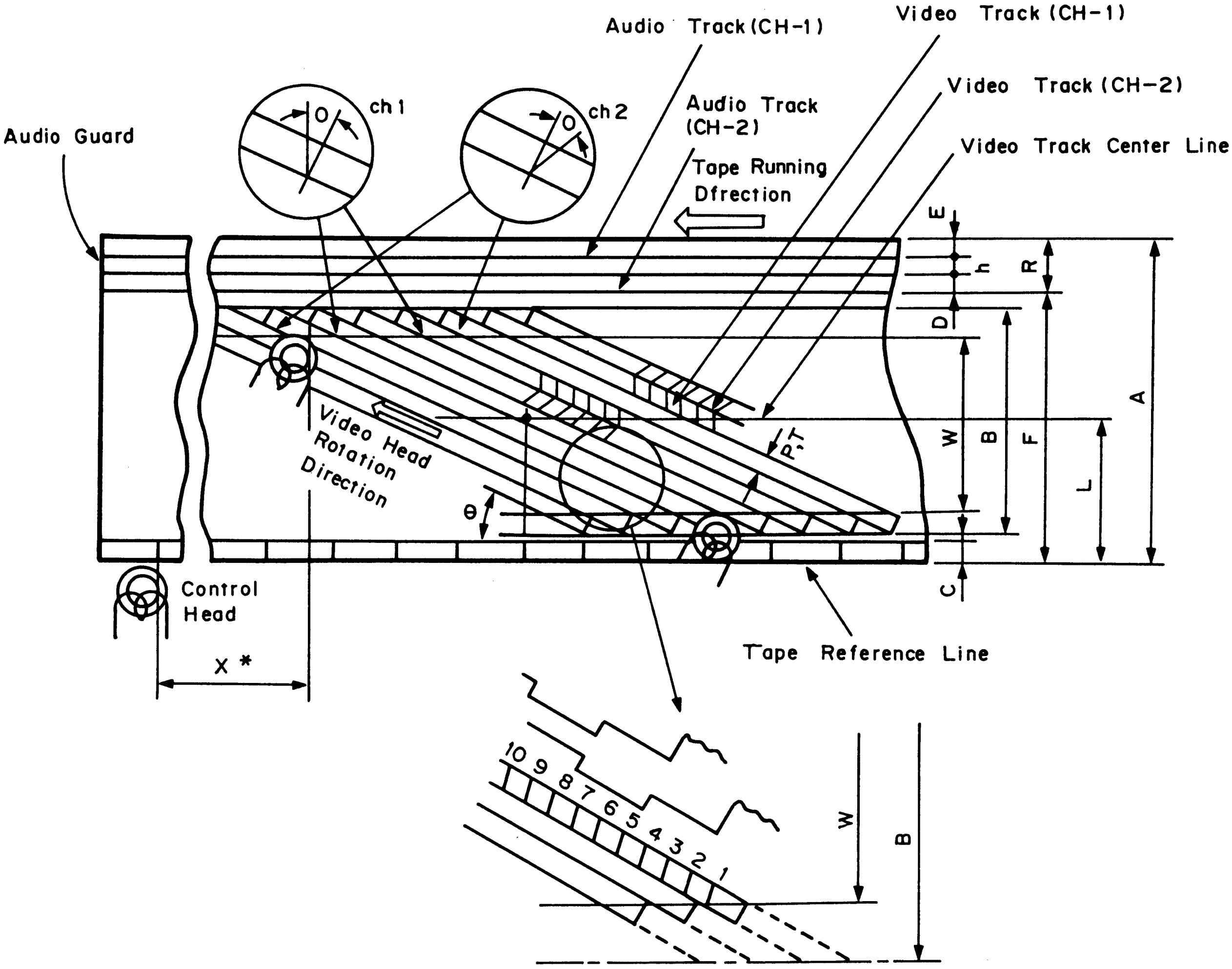
**RP1/RP2 Series**

**REFERENCE No. WM-530602**

# 1. OUTLINE OF VHS PAL FORMAT

## 1. TAPE PATTERN

The tape format of the VHS-PAL system is shown in Fig. 1


Audio Track (CH-1)
Video Track (CH-1)
Video Track (CH-2)
Audio Track (CH-2)
Video Track Center Line
Audio Guard
ch 1
ch 2
Tape Running Direction
E
h
R
D
W
B
F
A
L
P.T
θ
C
Video Head Rotation Direction
Control Head
X *
Tape Reference Line
10
9
8
7
6
5
4
3
2
1
W
B

* Distance on tape pattern between CH-2 video track 180° exit and CTL signal pulse

Fig. 1 VHS-PAL Tape Format

VHS-PAL Specifications

| Nr. | Symbol | Item | Unit | Standard | Remarks |
|---|---|---|---|---|---|
| 1. | (A) | Tape width | mm | 12.65 ± 0.01 | |
| 2. | (Vt) | Tape feed speed | mm/sec | 23.39 ± 0.5% (SP) | |
| 3. | (ϕ) | Drum diameter | mm | 62 ± 0.01 | Upper drum |
| 4. | (Vh) | Relative speed | m/sec | 4.85 | |
| 5. | (P) | Video track pitch | mm | 0.049 | |
| 6. | (B) | Total video width | mm | 10.60 | |
| 7. | (W) | Video width | mm | 10.07 | |
| 8. | (L) | Video track center | mm | 6.2 | From tape reference edge |
| 9. | (T) | Video track width | mm | 0.049 | |
| 10. | (C) | Control track width | mm | 0.75 ± 0.1 | |
| 11. | (R) | Audio track width | mm | 1.0 ± 0.1 | Single track |
| 12. | (D) | Audio track width | mm | 0.35 ± 0.05 | CH-2 (R) |
| 13. | (E) | Audio track width | mm | 0.35 ± 0.05 | CH-1 (L) |
| 14. | (F) | Audio track reference edge | mm | 11.65 ± 0.05 | From tape reference edge |
| 15. | (h) | Audio guard width | mm | 0.3 ± 0.05 | |
| 16. | (θ o) | Video track angle | | 5° 56′ 7.4″ | During tape run |
| 17. | (θ) | Video track angle | | 5° 57′ 50.3″ | During tape stop |
| 18. | (α) | Video head azimuth angle | | ± 6° (± 10′ ) | |
| 19. | (x) | Audio and control head position | mm | 79.244 | |
| 20. | | Position of V-SYNC | | 5~8H | |

**Table 1**

## 2. THE VIDEO SIGNAL RECORDING SYSTEM (PAL and MESECAM Systems)

### 2-1. Video Recording Systems

- Luminance signal recording : FM recording
- Color carrier signal :
  PAL : Low-frequency conversion with phase shifting and direct recording
  MESECAM : Low-frequency conversion direct recording

### 2-2. Recording Signal

CCIR monochrome, PAL and SECAM color TV signals

### 2-3. Video Signal Recording Frequency Range

- Monochrome luminance signal : 30 Hz to 4.2 MHz
- Composite luminance : 30 Hz to 3.0 MHz

### 2-4. Preemphasis Characteristics

$$\left.\begin{array}{l} T : 1.3 \pm 0.05\ \mu\text{sec} \\ X : 4 \pm 0.3 \end{array}\right\} \text{slope}$$

### 2-5. FM Carrier Frequency

WHITE PEAK 4.8 ± 0.1 MHz
SYNC TIP 3.8 ± 0.1 MHz

### 2-6. FM Carrier Frequency Deviation

1 ± 0.1 MHz

WHITE CLIP level : $160^{+10}_{-5}$ % from SYNC TIP

DARK CLIP level : 40 ± 10% from SYNC TIP (Between SYNC TIP and WHITE PEAK is considered as 100%)

### 2-7. Recording Current Characteristics

FM signal recording amplifier characteristics :

Saturated optimal recording current at frequencies 3.8 MHz or more.

At currents of 2 and 1 MHz, 3 dB ± 1 dB and 6 dB ± 15 dB assuming a current of 3.8 MHz to be 0 dB. Near flat characteristics for 1 MHz or less.

Conversion carrier chroma signal band :
Constant current characteristics

### 2-8. FM Signal Head Current

± 15 dB or less of optimal recording current of 4 MHz

### 2-9. Chroma Carrier Signal Conversion Frequency

- PAL : $f_C = 40 \times f_H + 1/8 f_H$ (626.953 Hz)

$f_H$ is horizontal SYNC frequency of input video signal

- MESECAM :

$f_{CR} = (40 + 1/8)\ f_H + f_O - f_{OR} = 654332$ Hz
$f_{CB} = (40 + 1/8)\ f_H + f_O - f_{OB} = 810572$ Hz

$f_{OR}/f_{OB}$ is input chroma signal frequency and $f_O$ is local frequency

$f_{OR}$ : 4.406250 MHz
$f_{OB}$ : 4.250000 MHz
$f_O$ : 4.433619 MHz

## 3. THE CHROMA CARRIER SIGNAL CONVERSION FOR RECORDING

CH-1 (Head azimuth 6° clockwise) Constant and non-varying

CH-2 (Head azimuth 6° counterclockwise) Delayed 90° per horizontal period

The recording carrier chroma signal is phase-switched for each line in a position equal to the horizontal SYNC signal period or to the front porch without disturbing the burst phase.

### 3-1. The Chroma Carrier Signal Conversion Recording Level

−7 to −10 dB from saturation (at PB output level)

### 3-2. Time Delay between Luminance ( Y ) and Converted Carrier Chroma Signals

0.1 µsec or less on video tape

### 3-3. Video Head response should be identical for the two channels.

## 4. BASIC BLOCK DIAGRAM OF THE PAL RECORDING SYSTEM

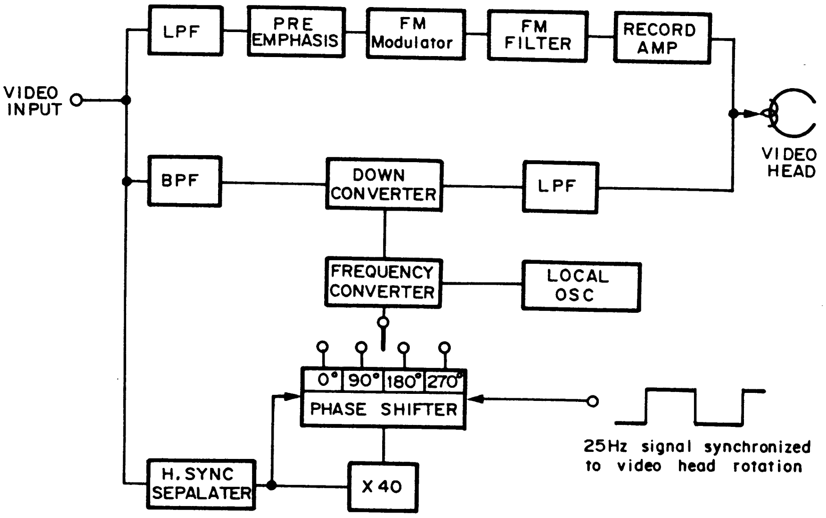

LPF
PRE EMPHASIS
FM Modulator
FM FILTER
RECORD AMP
VIDEO INPUT
VIDEO HEAD
BPF
DOWN CONVERTER
LPF
FREQUENCY CONVERTER
LOCAL OSC
0°
90°
180°
270°
PHASE SHIFTER
25Hz signal synchronized to video head rotation
H. SYNC SEPALATER
X 40

Fig. 2

## 5. THE RECORDING SIGNAL SPECTRUM

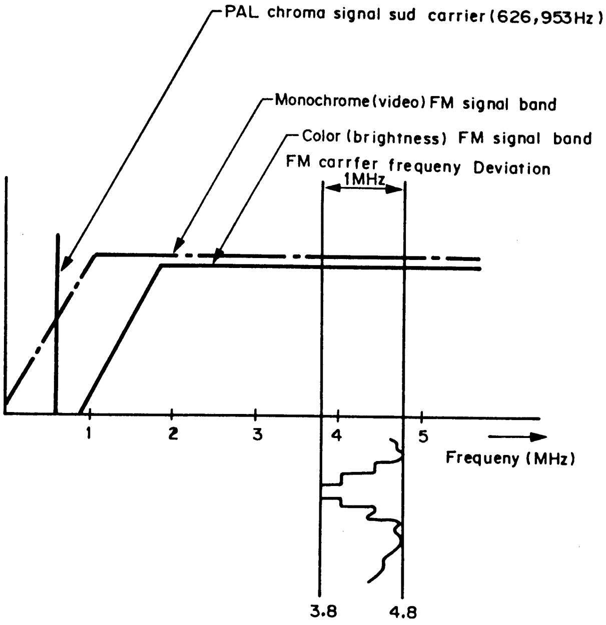


Fig. 3

## 6. BASIC BLOCK DIAGRAM OF THE MESECAM RECORDING SYSTEM

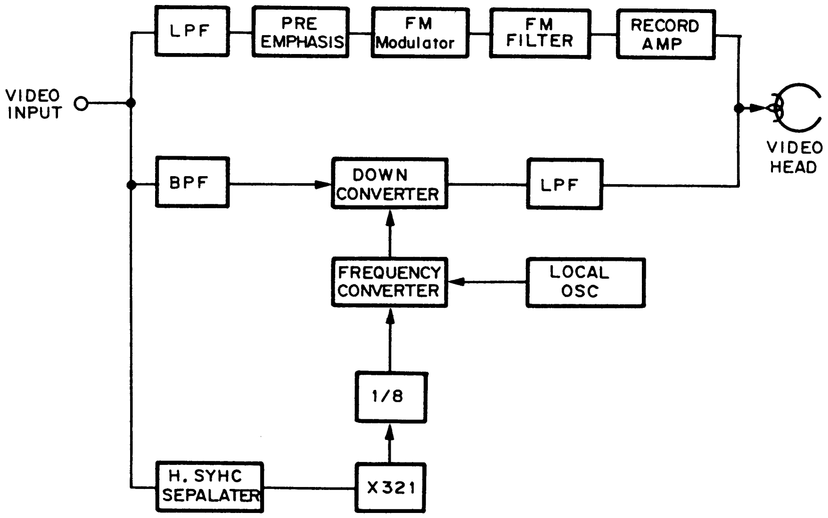

VIDEO INPUT
LPF
PRE EMPHASIS
FM Modulator
FM FILTER
RECORD AMP
VIDEO HEAD
BPF
DOWN CONVERTER
LPF
FREQUENCY CONVERTER
LOCAL OSC
1/8
H. SYHC SEPALATER
X321

Fig. 4

# 2. SYSTEM CONTROL CIRCUIT

## [OUTLINE]

This system control microprocessor (LC66308A) is a 4 bit C-MOS IC used for communications with the servo IC and timer channel microprocessor over a serial bus.

### [Block Diagram]

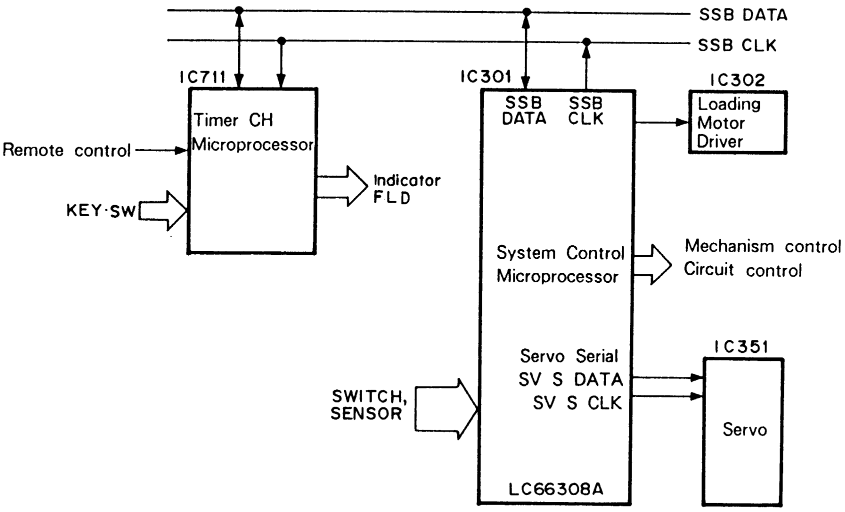

SSB DATA
SSB CLK
IC711
Timer CH Microprocessor
Remote control
KEY·SW
Indicator FLD
IC301
SSB DATA
SSB CLK
IC302
Loading Motor Driver
System Control Microprocessor
Mechanism control
Circuit control
IC351
Servo Serial
SV S DATA
SV S CLK
SWITCH, SENSOR
Servo
LC66308A

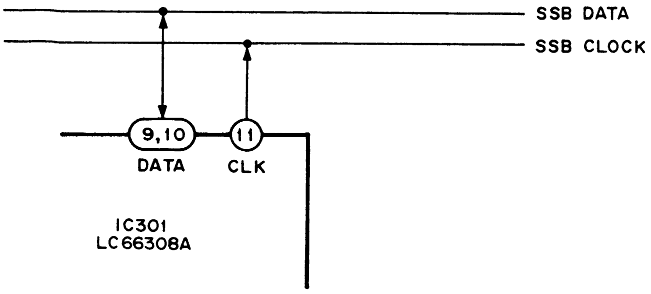
Fig. 1

## IC301 (LC66308A) SYSTEM CONTROL MPU PIN FUNCTIONS TABLE

| NO. | Name | I/O | I/O Signal Function |
|---|---|---|---|
| 1 | FF + REW | O | Output during FF/REW. |
| 2 | POWER UP | O | Output when the power is ON. POWER ON : H |
| 3 | INPUT SELECT | O | Output when selecting an EE external input. |
| 4 | AV CTL or<br>ANT/$\overline{\text{VTR}}$ | O<br>O | The same as the signal (PB H) for 8-pin Euro connector for selection of a RF converter output.<br>Option by Pin 41. |
| 5 | REC H | O | REC indication signal. REC : H |
| 6 | PB H | O | PB image output indication signal. PB image : H |
| 7 | STILL + F.ADV | O | Broaden the H DOC pulse width during still frame advance. |
| 8 | A MUTE | O | Audio output inhibit indication signal. MUTE : H |
| 9 | $\overline{\text{SSB DATA}}$ | I | For communications with the timer microprocessor.<br>8 bit × 12 block serial data. |
| 10 |  | O |  |
| 11 | $\overline{\text{SSB CLK}}$ | O | Clock pulse for SSB. |
| 12 | CTL PULSE | I | Approx. 25 Hz during REC/PB. Pulse for linear time counter.<br>For discrimination of audio output mute while playing back the non-recorded portion. |
| 13 | $\overline{\text{CAP. FG PULSE}}$ | I | Capstan FG signal. While checking the pulse width of this signal, the brake is applied to the capstan motor. |
| 14 | DOC PULSE | I | Noise feeding during STILL (PAUSE). |
| 15 | 4K PWM | O | Outputs a 4 kHz PWM signal for approx. twelve seconds at the start of FF/REW to gradually start the tape running speed. |
| 16 | HOLD | I | + 5V |
| 17 | ML F | O | For indicating the loading in FWD direction. |
| 18 | ML R | O | For indicating the loading in RVS direction. |
| 19 | TEST |  | GND |
| 20 | Vss |  | GND |
| 21 | OSC1 |  | Clock oscillator (clock frequency of 4 MHz). |
| 22 | OSC2 |  |  |
| 23 | $\overline{\text{RESET}}$ | I | Initial reset |
| 24 | $\overline{\text{ML L}}$ | O | Loading motor low-speed indication signal |
| 25 | $\overline{\text{ML M}}$ | O | Loading motor medium-speed indication signal |
| 26 | $\overline{\text{SW DATA 1}}$ | I | Mechanical position switch |
| 27 | $\overline{\text{SW DATA 2}}$ |  |  |
| 28 | $\overline{\text{SW DATA 3}}$ |  |  |
| 29 | $\overline{\text{RF SW PULSE}}$ | I | 25 Hz drum rotation detection during REC/PB. Takes timing during still noise feeding. |
| 30 | Mc BR | O | Capstan motor accelerating/decelerating signal<br>Capstan motor brake<br>Noise feeding during STILL |
| 31 | $\overline{\text{SV S DATA}}$ | O | Serial data to servo microprocessor |
| 32 | $\overline{\text{SV S CLK}}$ | O | Clock to the servo microprocessor |
| 33 | SAFTY SW | I | Erase prevention switch signal. With tab : L Without tab : H |
| 34 | FL START SW | I | Front loading (cassette loading) SW |
| 35 | V_REF | I | Reference voltage for internal comparator (for TAPE TOP S, TAPE END S ports) |
| 36 | REEL PULSE | I | Reel table rotation detection |
| 37 | DEW SENSOR | I | Dew detection DEW : H |
| 38 | TAPE TOP S. | I | Tape winding start detection |
| 39 | TAPE END S. | I | Tape winding end detection |
| 40 | Vdd |  | 5V |
| 41 | OPTION | I | For Pin 4 output selection<br>5V : AV CTL<br>2.5V : ANT/$\overline{\text{VTR}}$ |
| 42 | TAPE SPEED | I | Tape speed discriminating data during PB (SP : LOW LP : HIGH) |

**Table 1**

# 1. COMMUNICATIONS BETWEEN MICROPROCESSOR



SSB DATA
SSB CLOCK
9,10
11
DATA
CLK
IC301
LC66308A

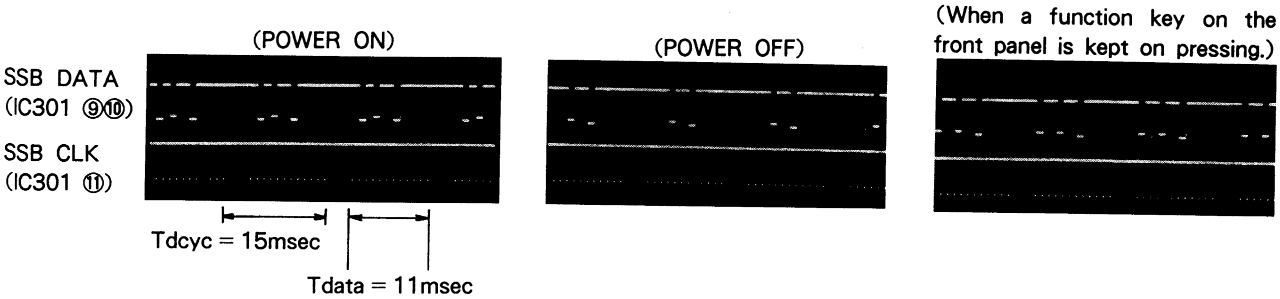
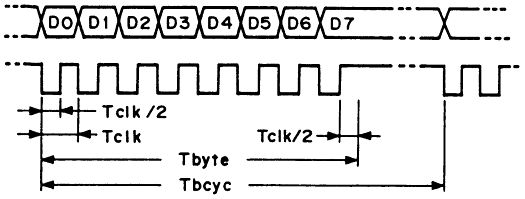


Fig. 2

**[Data Format]**
Enlarged View



D0
D1
D2
D3
D4
D5
D6
D7
Tclk /2
Tclk
Tclk/2
Tbyte
Tbcyc

| Characteristic | Symbol | MAX | TYP | MIN | Unit |
|---|---|---|---|---|---|
| Data Cycle Time | Tdcyc | 16.896 | 15.360 | 13.824 | ms |
| Data Area Width | Tdata | 12.531 | 11.392 | 10.253 | ms |
| Byte Width | Tbyte | 281.6 | 128 | 115.2 | µs |
| Byte Cycle Time | Tbcyc | 1126.4 | 1024 | 921.6 | µs |
| Clock-pulse Cycle Time | Tclk | 35.2 | 16 | 14.4 | µs |

## 2. FUNCTION KEY INPUT (TIMER MICROPROCESSOR IC711)

A scan pulse output from Pins 14 to 57 of IC711 is read at Pins 37 to 34 to judge just which key has now been pressed. The timer microprocessor places the result of key-in operation on SSB data and sends them to the system control microprocessor (IC301) as an operating instruction.

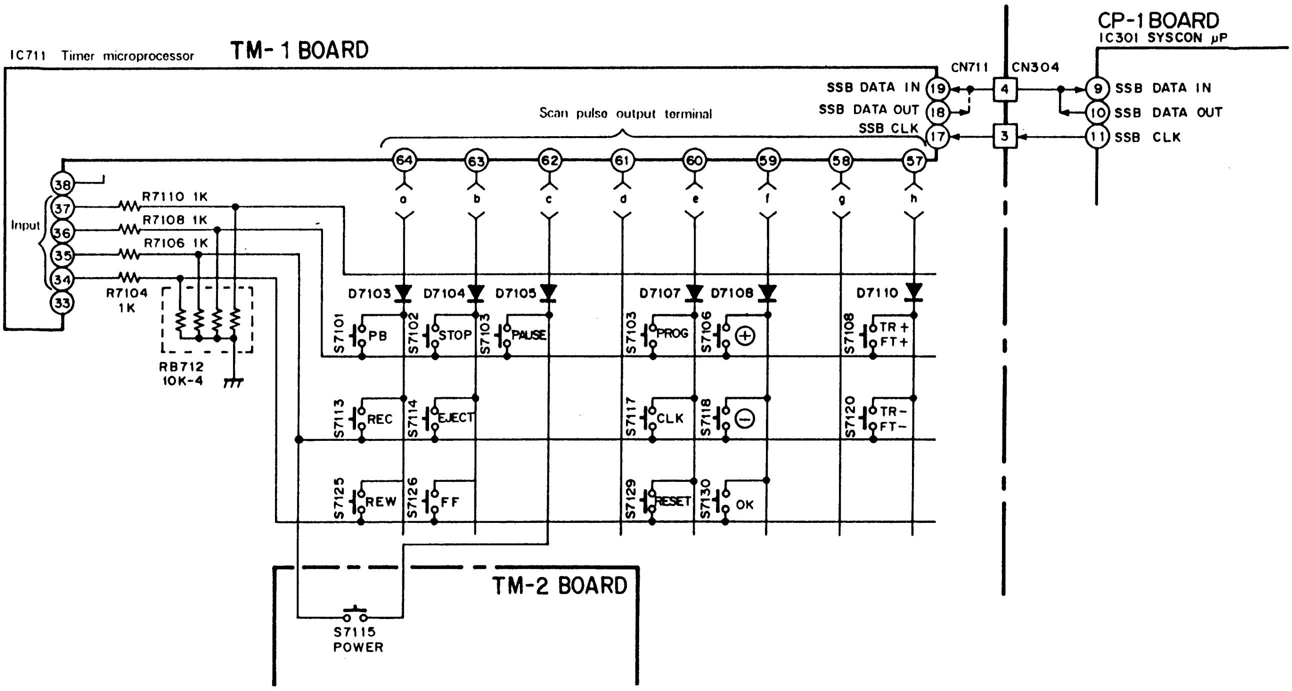

IC711 Timer microprocessor
TM-1 BOARD
Input
38
37
36
35
34
33
R7110 1K
R7108 1K
R7106 1K
R7104 1K
RB712 10K-4
Scan pulse output terminal
64
63
62
61
60
59
58
57
a
b
c
d
e
f
g
h
D7103
D7104
D7105
D7107
D7108
D7110
S7101
PB
S7102
STOP
S7103
PAUSE
S7103
PROG
S7106
⊕
S7108
TR+
FT+
S7113
REC
S7114
EJECT
S7117
CLK
S7118
⊖
S7120
TR−
FT−
S7125
REW
S7126
FF
S7129
RESET
S7130
OK
TM-2 BOARD
S7115
POWER
CN711
SSB DATA IN
19
SSB DATA OUT
18
SSB CLK
17
CN304
4
3
CP-1 BOARD
IC301 SYSCON μP
9
SSB DATA IN
10
SSB DATA OUT
11
SSB CLK

Fig. 3

# 3. MECHANISM OPERATION

## 3-1. INITIALIZE

This operation is to be made at the time of AC plug-in. Move the cassette and the tape to the INITIAL POSITION regardless where they are placed.

↓

Initial position means that the cassette is pulled in and placed down.

(1) To initialize, it is necessary to know the present condition. Therefore, the following must be sensed to begin with.
① Stage position
② Mechanism position

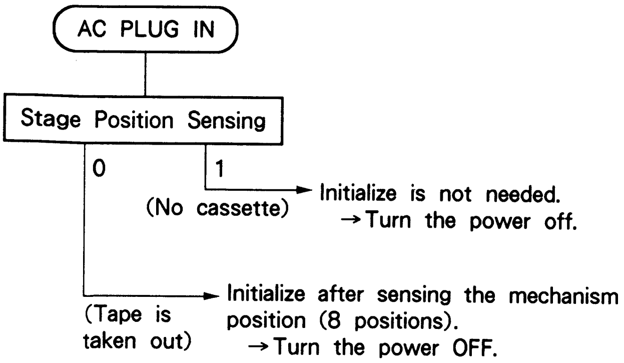
① **Stage position sensing (Position sensed by front loading switch.)**
There are two stage positions, which are expressed as given in the table below.

| Stage Position | Status | |
|---|---|---|
| | When inserting cassette | When ejecting |
| 0 | The cassette is placed down. | |
| 1 | No cassette | Upon ejection. (The condition in which the cassette is ejected.) |

No sensing of intermediate code is made.

② **Mechanism position sensing (Position sensed by mechanism position switch.)**
The stage 0 position is further classified into eight position.

**Initialize Flowchart**

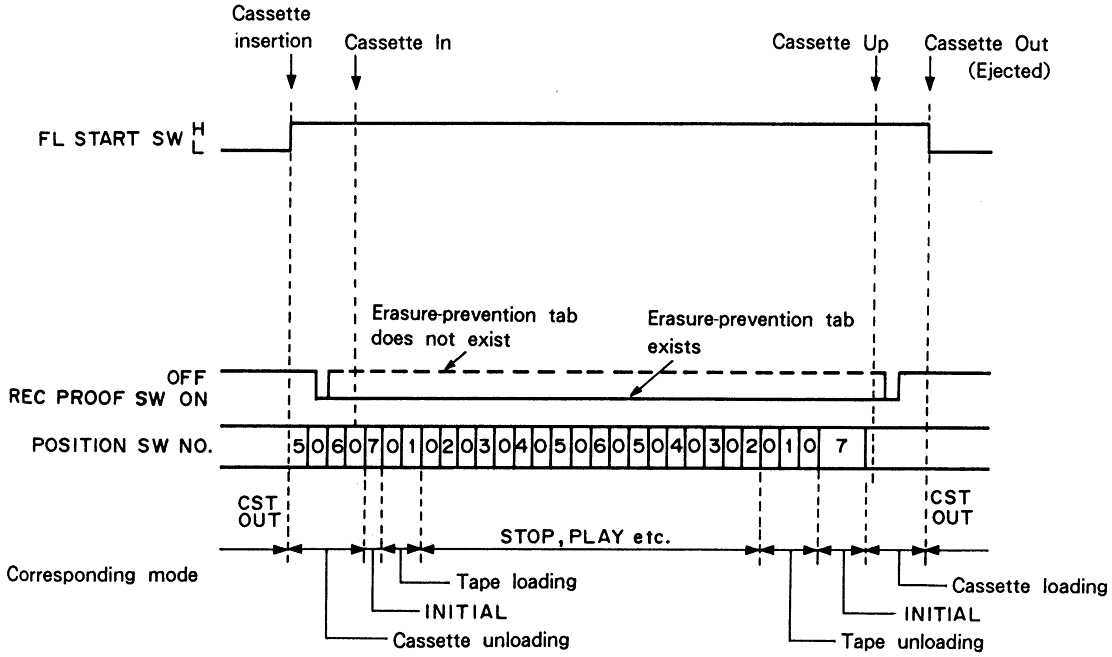


AC PLUG IN
Stage Position Sensing
0
1
(No cassette)
Initialize is not needed.
→Turn the power off.
(Tape is taken out)
Initialize after sensing the mechanism position (8 positions).
→Turn the power OFF.

**Mechanism Positions**

| Mechanism Position | SW DATA1 IC301 ㉖ | SW DATA2 IC301 ㉗ | SW DATA3 IC301 ㉘ | MODE |
|---|---|---|---|---|
| 0 MIDDLE | H | H | H | Intermediate position while moving |
| 1 BRAKE | L | H | H | Position at which the main brake is applied. |
| 2 STOP | H | L | H | STOP, FF, REW |
| 3 STILL | L | L | H | STILL (PB PAUSE), FRAME ADVANCE |
| 4 PLAY | H | H | L | PB, CUE, REC, REC PAUSE |
| 5 IDLER | L | H | L | Forward and reverse inverting positions (pinch roller is off, and the idler gear is operated with the tape in the loaded state.) |
| 6 REV | H | L | L | REVIEW |
| 7 INITIAL | L | L | L | Initial position (Tape unloading finished state.) |

### ③ Mechanism switch timing

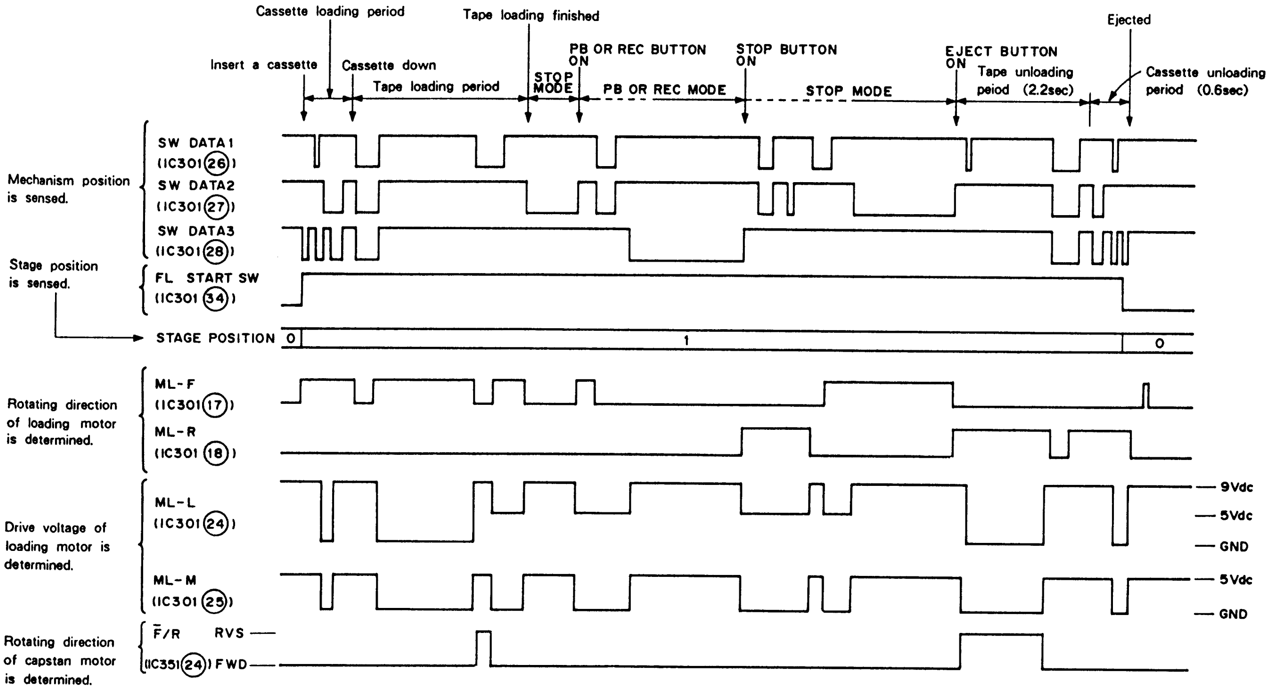

Cassette insertion
Cassette In
Cassette Up
Cassette Out (Ejected)
FL START SW H L
Erasure-prevention tab does not exist
Erasure-prevention tab exists
OFF
REC PROOF SW ON
POSITION SW NO.
5 0 6 0 7 0 1 0 2 0 3 0 4 0 5 0 6 0 5 0 4 0 3 0 2 0 1 0 7
CST OUT
CST OUT
STOP, PLAY etc.
Corresponding mode
Tape loading
INITIAL
Cassette unloading
Cassette loading
INITIAL
Tape unloading

Time taken to move to each position (for references) (Unit : sec)

| POS. | 7 | 0 | 1 | 0 | 2 | 0 | 3 | 0 | 4 | 0 | 5 | 0 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time | 0.72 | 1.16 | 0.12 | 0.26 | 0.22 | 0.16 | 0.22 | 0.34 | 0.14 | 0.12 | 0.14 | 0.14 | |

## 3-2. CASSETTE LOADING/UNLOADING AND TAPE LOADING/UNLOADING

When a cassette is inserted, the tape is pulled out and then it has been wound around the drum before this unit is stopped.
The drum motor continues to operate, but it comes to a stop automatically five minutes later if no function key is pressed.


Cassette loading period
Tape loading finished
Ejected
Insert a cassette
Cassette down
Tape loading period
STOP MODE
PB OR REC BUTTON ON
PB OR REC MODE
STOP BUTTON ON
STOP MODE
EJECT BUTTON ON
Tape unloading peiod (2.2sec)
Cassette unloading period (0.6sec)
Mechanism position is sensed.
SW DATA1 (IC301㉖)
SW DATA2 (IC301㉗)
SW DATA3 (IC301㉘)
Stage position is sensed.
FL START SW (IC301㉞)
STAGE POSITION
0
1
0
Rotating direction of loading motor is determined.
ML-F (IC301⑰)
ML-R (IC301⑱)
Drive voltage of loading motor is determined.
ML-L (IC301㉔)
9Vdc
5Vdc
GND
ML-M (IC301㉕)
5Vdc
GND
Rotating direction of capstan motor is determined.
F̄/R (IC351㉔)
RVS
FWD

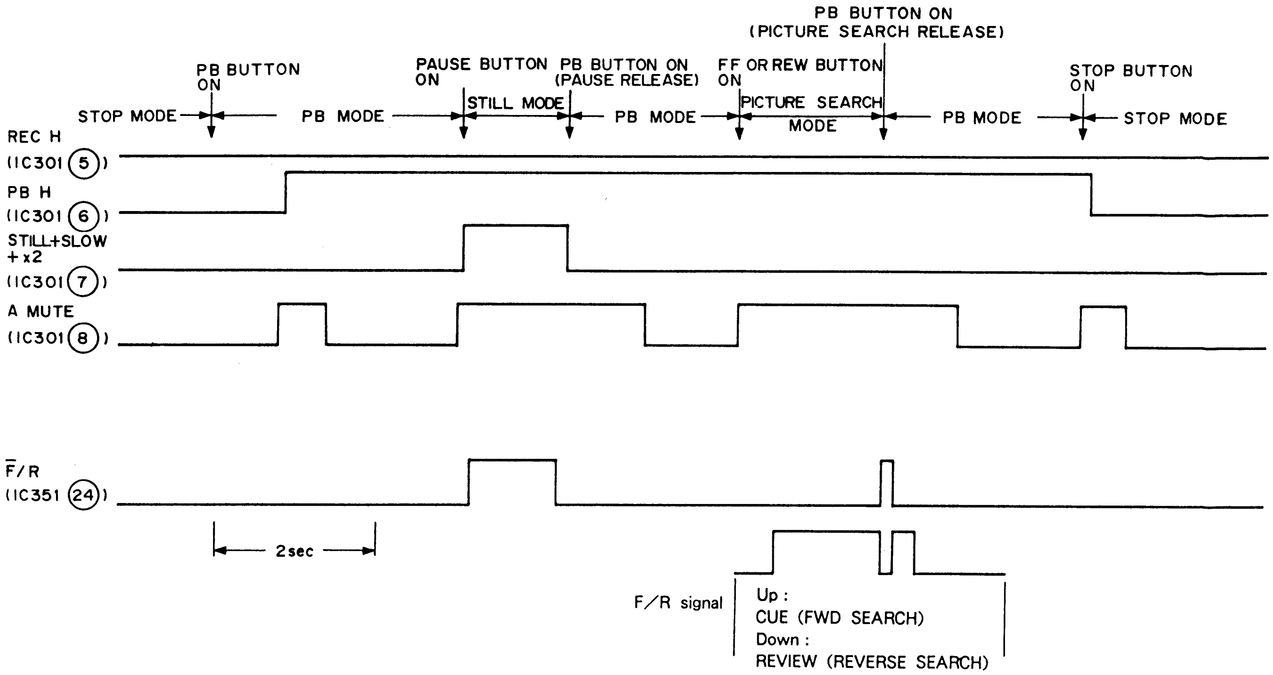
**[Cassette Loading]**
When a cassette is inserted, the FL SW signal changes from L level to H level. With this change, the microprocessor senses that the cassette has now been inserted. This in turn causes the loading motor to rotate in the forward direction, pulling the cassette in.

**[Tape Loading]**
As the mechanism mode detecting SW changes to 7, the microprocessor senses that the cassette has now been placed down. This in turn causes the loading motor to rotate in the forward direction and the tape to be pulled out of the cassette for winding on to the drum.

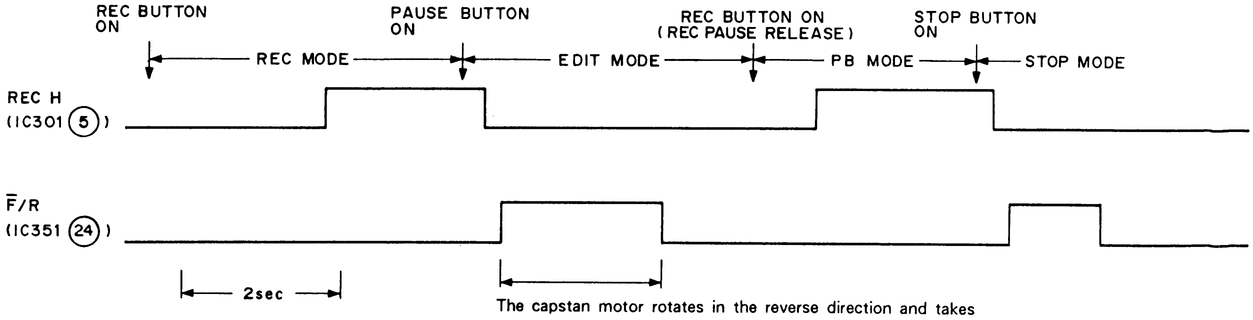
**[Tape Unloading]**
As the EJECT button is pressed, the loading motor rotates in the reverse direction and takes up the tape into the cassette while the reel table is being turned with the capstan motor.

**[Cassette Unloading]**
Cassette ejection is sensed by the fact that the loading motor has been rotated in the reverse direction, and that the FL SW signal has changed from H level to L level.

## 3-3. PB MODE


PB BUTTON ON
(PICTURE SEARCH RELEASE)
PB BUTTON
ON
PAUSE BUTTON
ON
PB BUTTON ON
(PAUSE RELEASE)
FF OR REW BUTTON
ON
STOP BUTTON
ON
STOP MODE
PB MODE
STILL MODE
PB MODE
PICTURE SEARCH
MODE
PB MODE
STOP MODE
REC H
(IC301 ⑤)
PB H
(IC301 ⑥)
STILL+SLOW
+x2
(IC301 ⑦)
A MUTE
(IC301 ⑧)
F̄/R
(IC351 ㉔)
2sec
F/R signal
Up :
CUE (FWD SEARCH)
Down :
REVIEW (REVERSE SEARCH)

## 3-4. REC MODE

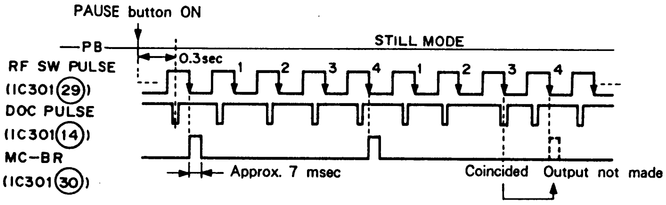

REC BUTTON
ON
PAUSE BUTTON
ON
REC BUTTON ON
(REC PAUSE RELEASE)
STOP BUTTON
ON
REC MODE
EDIT MODE
PB MODE
STOP MODE
REC H
(IC301 ⑤)
F̄/R
(IC351 ㉔)
2sec

The capstan motor rotates in the reverse direction and takes up the tape into the cassette (Max. 3sec)

# 4. OPERATION OF VARIOUS CIRCUITS

(1) Noiseless STILL (PB PAUSE)
When the PAUSE button is pressed during PB mode, the STILL mode is selected, and the still picture appears.
Perform the following operations to obtain a noiseless still picture.

1) When the PAUSE button is pressed during PB mode, detects the drop out pulse, and pulse drives until the capstan motor coincides with falling (⌉_).


PAUSE button ON
PB
STILL MODE
0.3sec
RF SW PULSE (IC301㉙)
1
2
3
4
1
2
3
4
DOC PULSE (IC301⑭)
MC-BR (IC301㉚)
Approx. 7 msec
Coincided
Output not made

2) Pulse drive the capstan motor to make frame advance possible while pushing the PAUSE button during STILL mode.
When pressing the PAUSE button is stopped, the above operation (1) is made, placing the unit in the STILL mode.

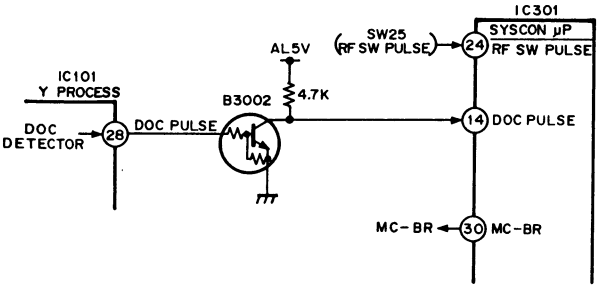

IC301
SYSCON μP
SW25
(RF SW PULSE)
AL5V
24
RF SW PULSE
IC101
Y PROCESS
B3002
4.7K
DOC DETECTOR
28
DOC PULSE
14
DOC PULSE
MC-BR
30
MC-BR

Fig. 4

(2) Tracking Control
The tracking circuit consists of an analog tracking circuit and a digital tracking circuit, but the analog tracking circuit is fixed, while the digital tracking circuit is variable.

1) Operation
Change the tracking data with the TRACKING + button or TRACKING − button. The tracking data is available at forty five stages.
2) The tracking data is reset and set to the center in the following cases :
① After microprocessor reset.
② Cassette In.
③ When the REC mode is selected.
3) Display
Tracking data is displayed on the indicator.

(3) Loading Motor Drive Circuit

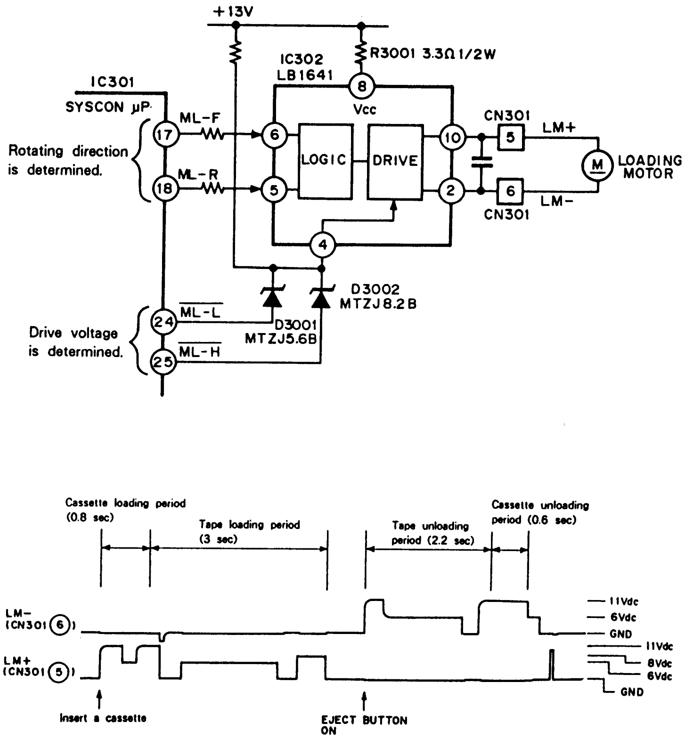
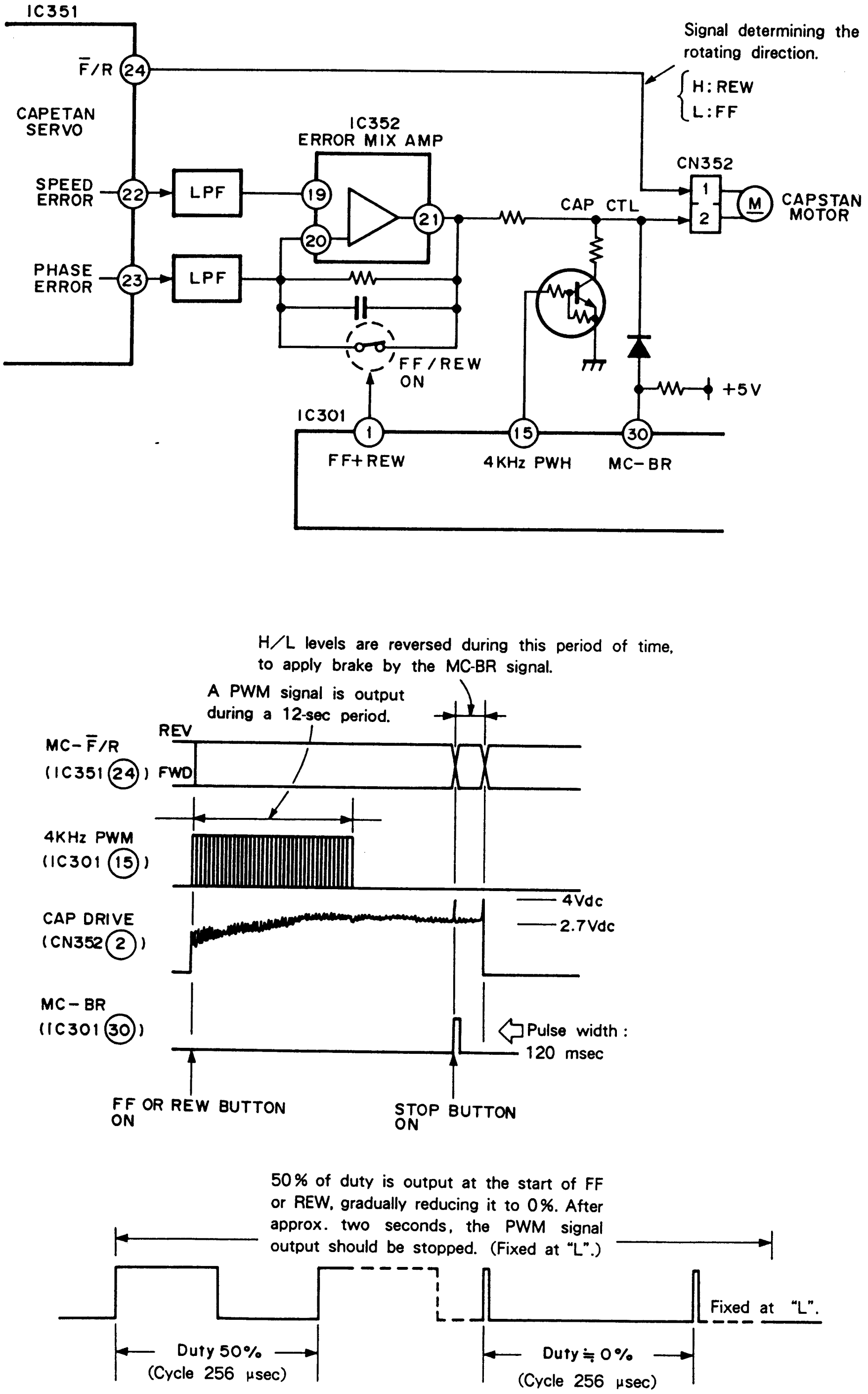

+13V
IC302
LB1641
R3001 3.3Ω 1/2W
IC301
SYSCON μP
8
Vcc
CN301
LM+
Rotating direction is determined.
17
ML-F
6
LOGIC
DRIVE
10
5
LOADING MOTOR
M
18
ML-R
5
2
6
LM-
CN301
4
D3002
MTZJ8.2B
Drive voltage is determined.
24
ML-L
D3001
MTZJ5.6B
25
ML-H
Cassette loading period (0.8 sec)
Tape loading period (3 sec)
Tape unloading period (2.2 sec)
Cassette unloading period (0.6 sec)
LM- (CN301⑥)
LM+ (CN301⑤)
11Vdc
6Vdc
GND
11Vdc
8Vdc
6Vdc
GND
Insert a cassette
EJECT BUTTON ON

Fig. 5

### (4) FF/REW mode Slow Starting

FF/REW operation is done without removing the tape from the drum in this unit, a PWM signal is output at the start of either FF or REW mode to gradually increase the tape running speed.


IC351
F̄/R 24
CAPETAN SERVO
SPEED ERROR 22
PHASE ERROR 23
LPF
LPF
IC352 ERROR MIX AMP
19
20
21
CAP CTL
CN352
1
2
M
CAPSTAN MOTOR
FF/REW ON
IC301
1
15
30
FF+REW
4KHz PWH
MC-BR
+5V
REV
FWD
MC-F̄/R (IC351 24)
4KHz PWM (IC301 15)
CAP DRIVE (CN352 2)
MC-BR (IC301 30)
4Vdc
2.7Vdc
FF OR REW BUTTON ON
STOP BUTTON ON
Duty 50% (Cycle 256 μsec)
Duty ≒ 0% (Cycle 256 μsec)
Fixed at "L".

Signal determining the rotating direction.
H: REW
L: FF

H/L levels are reversed during this period of time, to apply brake by the MC-BR signal.

A PWM signal is output during a 12-sec period.

Pulse width : 120 msec

50% of duty is output at the start of FF or REW, gradually reducing it to 0%. After approx. two seconds, the PWM signal output should be stopped. (Fixed at "L".)

Fig. 6

## 5. PROTECTION CIRCUIT

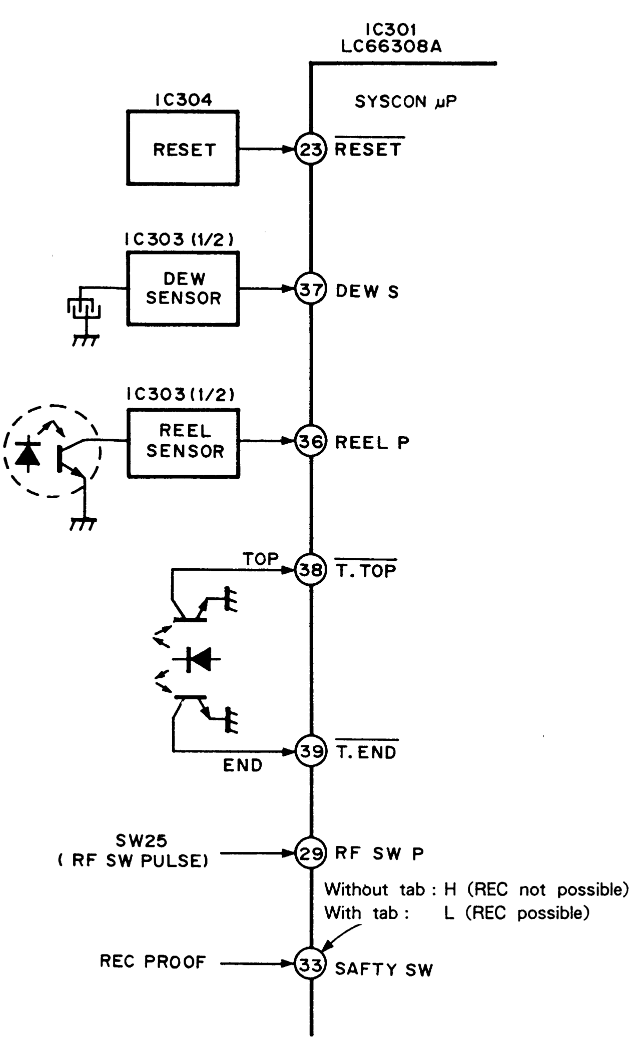

IC301
LC66308A
SYSCON µP
IC304
RESET
23
RESET
IC303 (1/2)
DEW SENSOR
37
DEW S
IC303 (1/2)
REEL SENSOR
36
REEL P
TOP
38
T.TOP
END
39
T.END
SW25
( RF SW PULSE)
29
RF SW P
Without tab : H (REC not possible)
With tab : L (REC possible)
REC PROOF
33
SAFTY SW

Fig. 7

(1) Microprocessor reset circuit
This circuit outputs a reset signal and resets each microprocessor upon insertion of the AC plug into the plug receptacle.

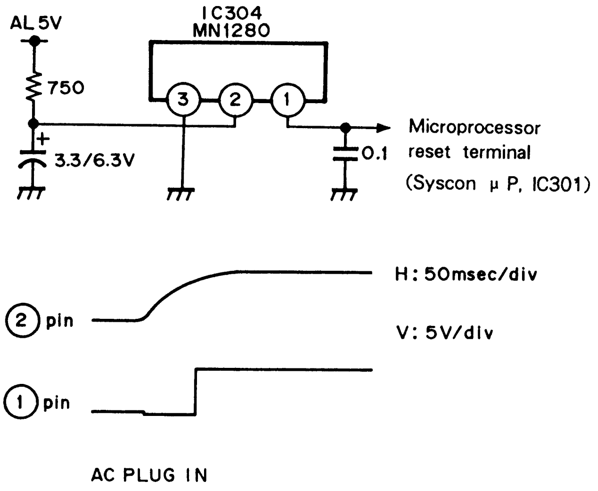

AL5V
IC304
MN1280
750
3
2
1
3.3/6.3V
0.1
Microprocessor reset terminal
(Syscon µ P, IC301)
2 pin
1 pin
H: 50msec/div
V: 5V/div
AC PLUG IN

Fig. 8

A reset circuit is also incorporated in the timer/tuning microprocessor, but its operation is almost the same as described above.

(2) Dew sensor (Dew sensor is not equiped by some model.)

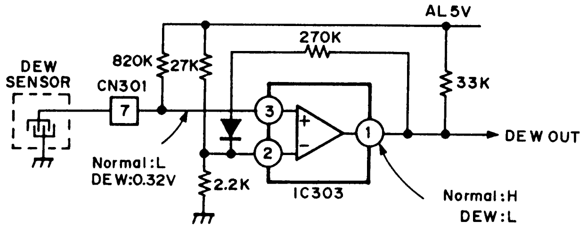

AL5V
270K
DEW SENSOR
820K
27K
CN301
7
33K
3
2
1
DEW OUT
Normal:L
DEW:0.32V
2.2K
IC303
Normal:H
DEW:L

Fig. 9

The impedance of the dew sensor is normally 0 Ω. The voltage at Pin 3 is therefore 0V. When dew is sensed, and the impedance of the dew sensor gradually increases (in excess of 20 kΩ). The voltage at Pin 3 reaches or exceeds 0.32V as a result. The comparator is now inverted from H to L, and the system control microprocessor judges the presence of a dew. A diode is provided for protection because the withstand voltage of the dew sensor is so low as below 1V.

### (3) Reel sensor

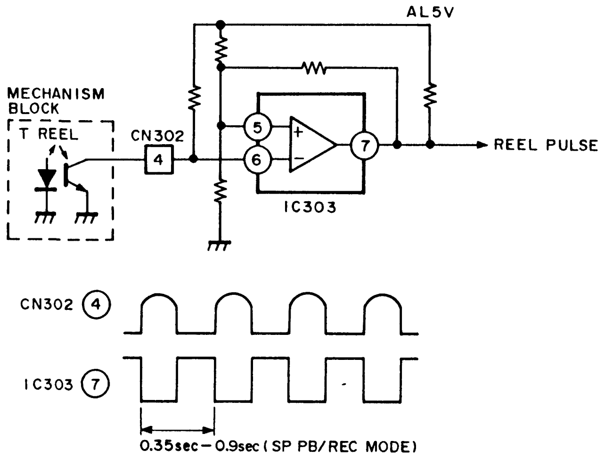

AL5V
MECHANISM BLOCK
T REEL
CN302
4
5
6
7
IC303
REEL PULSE
CN302 ④
IC303 ⑦
0.35sec−0.9sec (SP PB/REC MODE)

**Fig. 10**

The rotation of the reel table is sensed on the tape take-up side only. In the FF, REW, or PICTURE SEARCH (CUE, REVIEW) mode, a pulse does not exist for one second. Also in the REC or PB mode, a pulse does not exist for 2.5 sec. Therefore, the mode moves over to the STOP mode. In the FF or REW mode during a PWM signal is output, the rotation of the reel table is not sensed, however.

### (4) Tape top/end sensor

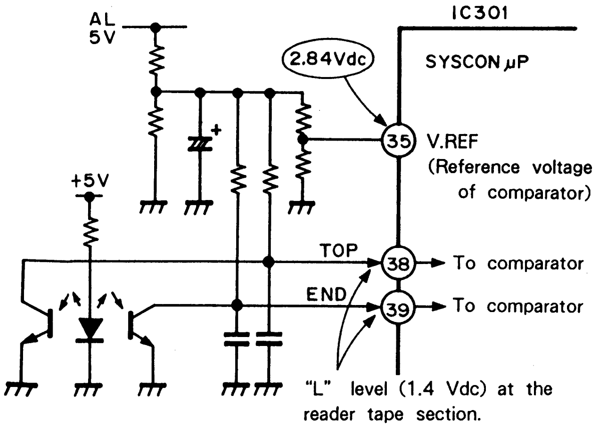
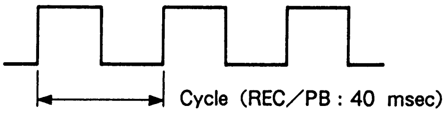

AL 5V
+5V
IC301
SYSCON μP
2.84Vdc
35
V.REF
(Reference voltage of comparator)
TOP
END
38
39
To comparator
To comparator
"L" level (1.4 Vdc) at the reader tape section.

**Fig. 11**

When the tape reaches the top (beginning of tape) or the end (at the end of tape), the transparent reader tape section appears.
When this section appears, the photo transistor is turned ON, so that the input terminals (Pins 38, 39) of the system control microprocessor are forced "L" (approx. 1.4 Vdc).

### (5) Drum Rotation Sensing

The presence and absence of a SW 25 signal (RF SW pulse) is sensed, and when the cycle is in excess of 300 msec, the drum rotation is judged faulty. The operation therefore stops.


Cycle (REC/PB : 40 msec)

### (6) REC proof switch

This switch senses the presence and absence of the erase protection tab of the cassette for preventing data from being recorded on the tape during the REC mode of operation.
When the tab exists, Pin 12 does recording at "L", but when the tab is not bent, it becomes "H", which makes recording impossible.

### (7) Mode timer

If the same mode is continuously maintained, the mode changes as given below by the internal timer.

| Current mode | Mode to be changed to | Timer |
|---|---|---|
| PB PAUSE | STOP | 5 min |
| REC PAUSE | STOP | 5 min |
| Cassette loading | Cassette unloading | 2.5 sec |
| Cassette unloading | Cassette loading | 2.5 sec |
| Tape loading | Tape unloading | 4.5 sec |
| Tape unloading | POWEER OFF | 4.5 sec |

**Note :** This unit shows a playback picture very quickly during STOP→PB mode. Therefore, the drum motor is rotated even during STOP mode. But the drum motor stops if this continues for more than five minutes.

# 3. SERVO CIRCUIT

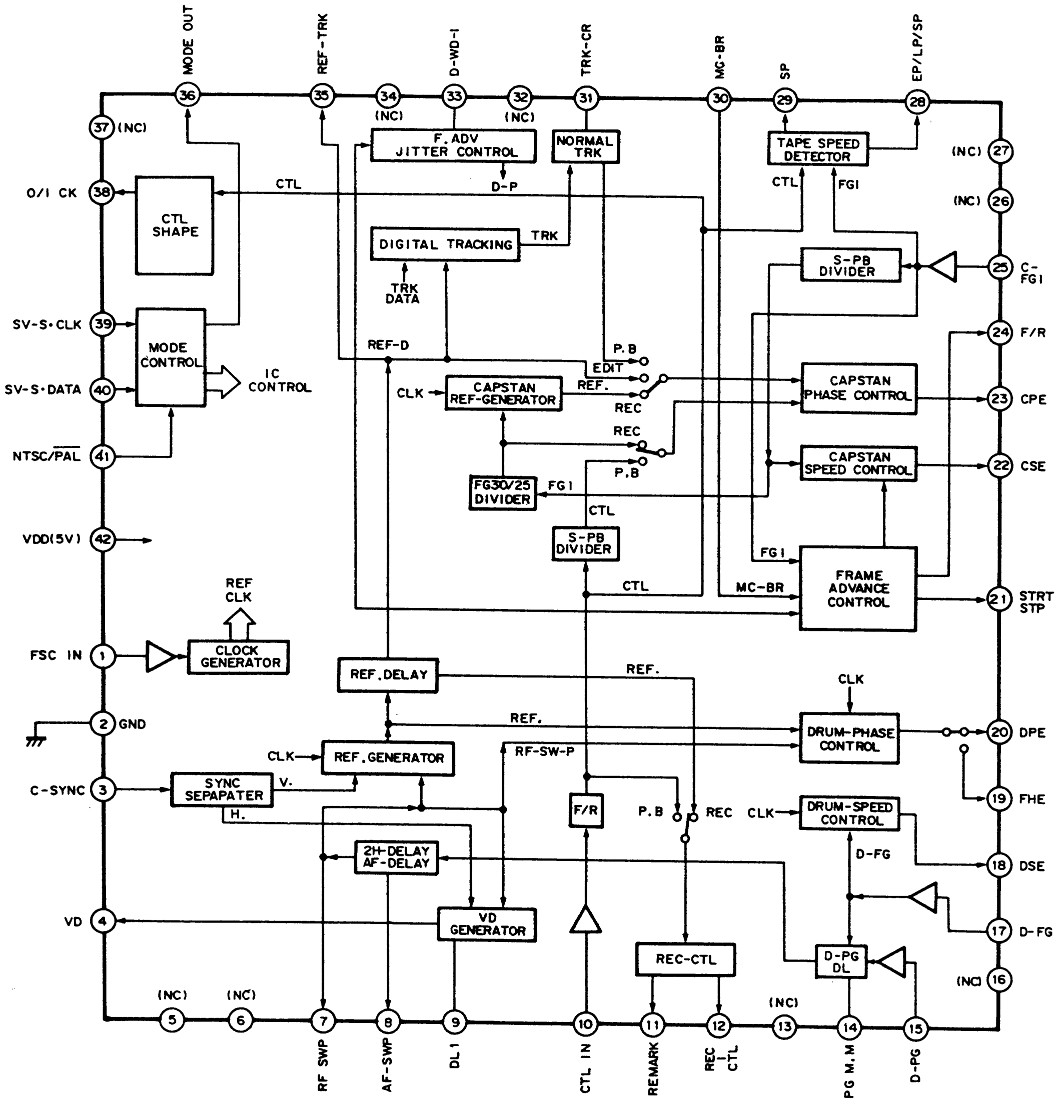
## [OUTLINE]

The digital servo IC (LC7416-8080) is a C-MOS LSI containing ROM. It operates in a wide variety of modes with ROM address specified based on the data from the system control circuit.

[**Major Functions**]

- Drum system speed and phase servo control.
- Capstan system speed and phase servo control.
- Phase servo reference signal generation.
- Mode control according to 16 bit serial data.
- Playback time tape speed automatic discrimination (SP/LP).
- Special playback time control. (FG frequency division and pseudo VD signal, etc.)
- Digital tracking control.
- Hi-fi audio head select signal generation. (Not used in this unit.)
- Frame advance control. (Not used in this unit.)

[**Block Diagram**]



MODE OUT
REF-TRK
D-WD-I
TRK-CR
MC-BR
SP
EP/LP/SP
36
35
34
33
32
31
30
29
28
(NC)
(NC)
37 (NC)
O/I CK 38
SV-S•CLK 39
SV-S•DATA 40
NTSC/PAL 41
VDD(5V) 42
FSC IN 1
2 GND
C-SYNC 3
VD 4
(NC) 27
(NC) 26
25 C-FGI
24 F/R
23 CPE
22 CSE
21 STRT STP
20 DPE
19 FHE
18 DSE
17 D-FG
(NC) 16
(NC) 5
(NC) 6
7
8
9
10
11
12
(NC) 13
14
15
RF SWP
AF-SWP
DL1
CTL IN
REMARK
REC CTL
PG M.M
D-PG
F.ADV JITTER CONTROL
D-P
NORMAL TRK
TAPE SPEED DETECTOR
CTL
FGI
CTL SHAPE
DIGITAL TRACKING
TRK
TRK DATA
S-PB DIVIDER
MODE CONTROL
IC CONTROL
REF-D
P.B
EDIT
REF.
REC
CLK
CAPSTAN REF-GENERATOR
CAPSTAN PHASE CONTROL
CAPSTAN SPEED CONTROL
FG30/25 DIVIDER
FG I
S-PB DIVIDER
FRAME ADVANCE CONTROL
MC-BR
REF CLK
CLOCK GENERATOR
REF.DELAY
DRUM-PHASE CONTROL
REF.GENERATOR
RF-SW-P
SYNC SEPAPATER
V.
H.
F/R
P.B
REC
DRUM-SPEED CONTROL
D-FG
2H-DELAY AF-DELAY
VD GENERATOR
REC-CTL
D-PG DL

Fig. 1.

## 1. MODE CONTROL

Reference data corresponding to various operation modes (STOP, REC, PB, REW, F.FWD, etc.) and various control signals (CAPSTAN FWD/RVS, DRUM ON, TAPE SPEED, etc.) are read by 16 bit serial data from the system control circuit for control of the servo circuit.

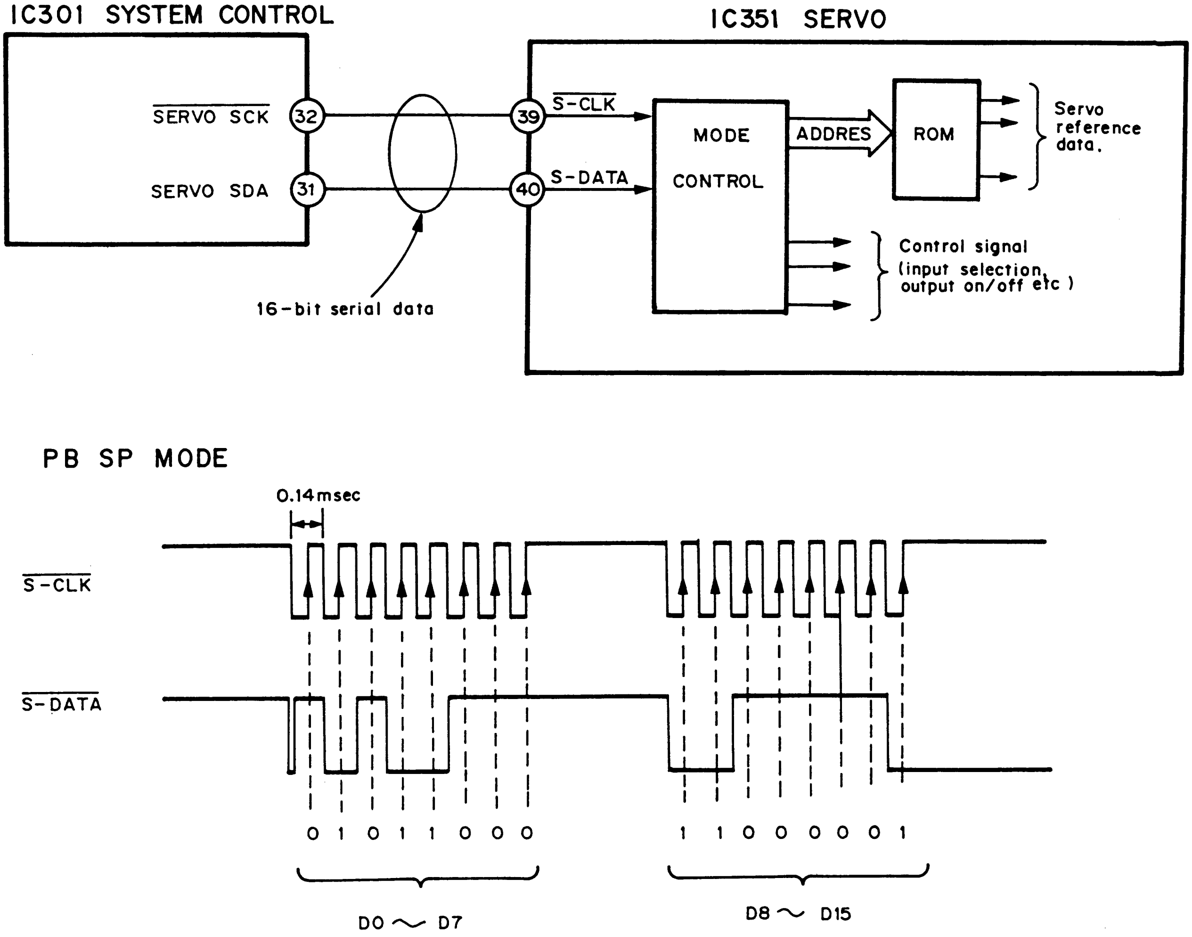

IC301 SYSTEM CONTROL
SERVO SCK
32
SERVO SDA
31
16-bit serial data
IC351 SERVO
39
S-CLK
40
S-DATA
MODE CONTROL
ADDRES
ROM
Servo reference data.
Control signal (input selection, output on/off etc )
PB SP MODE
0.14msec
S-CLK
S-DATA
0 1 0 1 1 0 0 0
1 1 0 0 0 0 0 1
D0 ~ D7
D8 ~ D15

Fig. 2.

For details of 16 bit serial data, refer to the system control circuit diagram.

## 2. DRUM SERVO

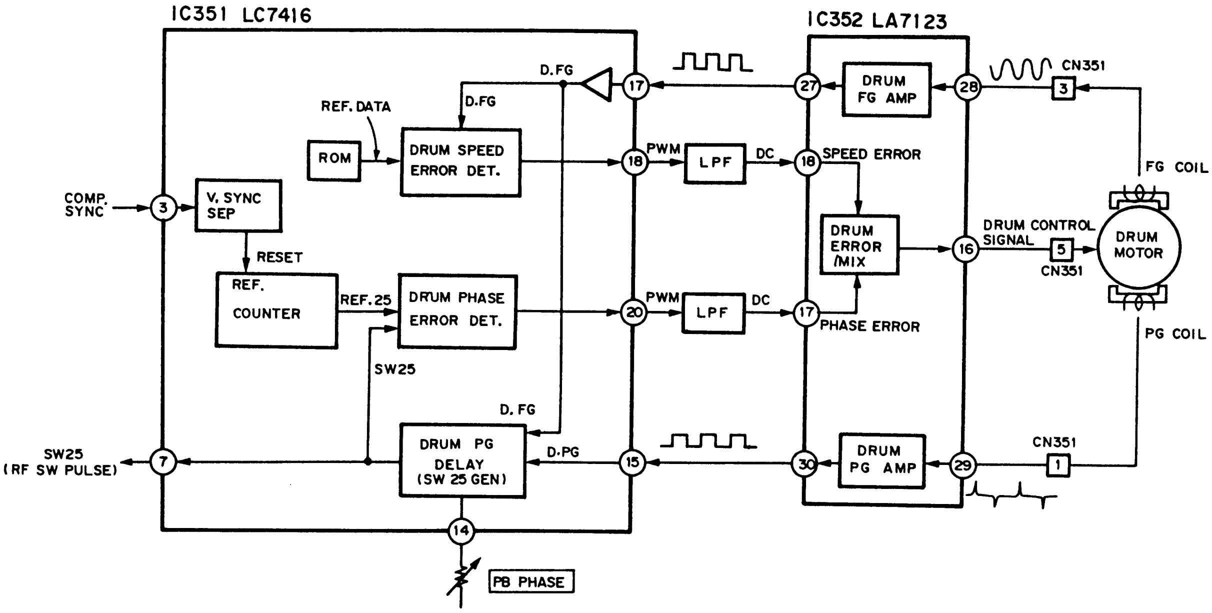

IC351 LC7416
IC352 LA7123
D.FG
D.FG
REF. DATA
ROM
DRUM SPEED ERROR DET.
COMP. SYNC
V. SYNC SEP
RESET
REF. COUNTER
REF.25
DRUM PHASE ERROR DET.
SW25
D. FG
DRUM PG DELAY (SW 25 GEN)
D.PG
SW25 (RF SW PULSE)
PB PHASE
PWM
LPF
DC
SPEED ERROR
PWM
LPF
DC
PHASE ERROR
DRUM FG AMP
DRUM ERROR /MIX
DRUM PG AMP
CN351
FG COIL
DRUM CONTROL SIGNAL
CN351
DRUM MOTOR
PG COIL
CN351
3
5
1
3
7
14
15
17
18
20
16
17
18
27
28
29
30

Fig. 3.

**[Drum Speed Error]**

A speed error is detected by measuring the drum FG signal fed to Pin 17 and output to Pin 18 by the PWM signal.

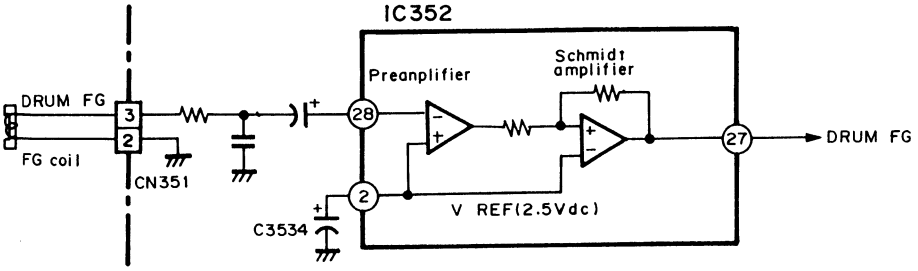
**[Drum Phase Error]**

A SW25 signal is generated by a combination of the drum FG signal fed to Pin 17 and the drum PG signal fed to Pin 15 to compare the phase of the REF25 signal received from the reference counter. This SW25 signal is then output to Pin 20 by the PWM signal.

The reference counter, incidentally, is synchronized with the vertical sync signal during REC operation.

## 2-1. DRUM FG AMPLIFIER

The drum FG amplifier shapes the drum FG signal (30 waves/rotation = 750 Hz) generated at the drum FG coil to the waveform of a rectangular wave.


IC352
Schmidt amplifier
Preanplifier
DRUM FG
3
2
FG coil
CN351
28
27
DRUM FG
2
V REF(2.5Vdc)
C3534

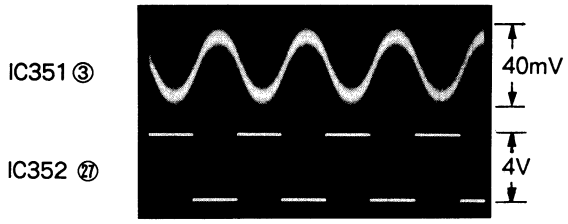
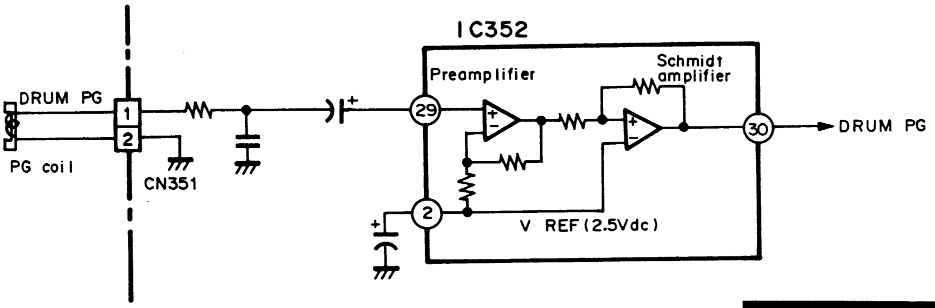


Fig. 4.

## 2-2. DRUM PG AMPLIFIER

The drum PG amplifier shapes the drum PG signal (40 msec cycle = 25 Hz) generated at the drum PG coil to the waveform of a rectangular wave.


IC352
Preamplifier
Schmidt amplifier
DRUM PG
1
2
PG coil
CN351
29
30
DRUM PG
2
V REF(2.5Vdc)

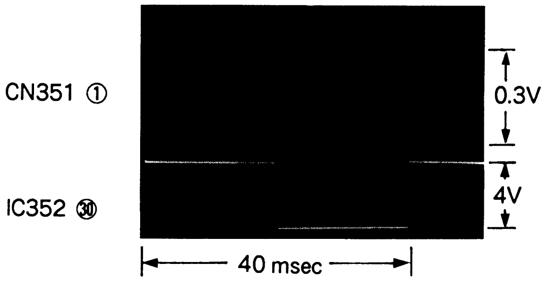
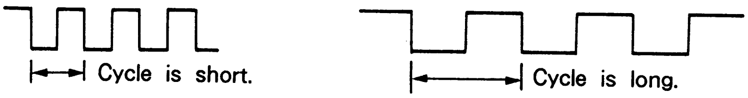


Fig. 5.

## 2-3. DRUM SPEED ERROR DETECTION

The cycle of the drum FG signal is measured.


Cycle is short.
Cycle is long.

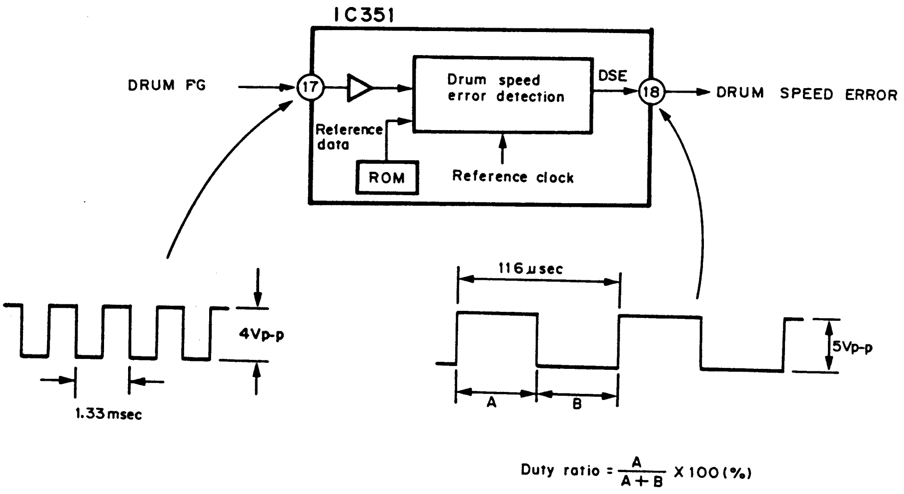

IC351
DRUM FG
17
Drum speed error detection
DSE
18
DRUM SPEED ERROR
Reference data
ROM
Reference clock
4Vp-p
1.33msec
116μsec
5Vp-p
A
B
Duty ratio = A/(A+B) X 100(%)

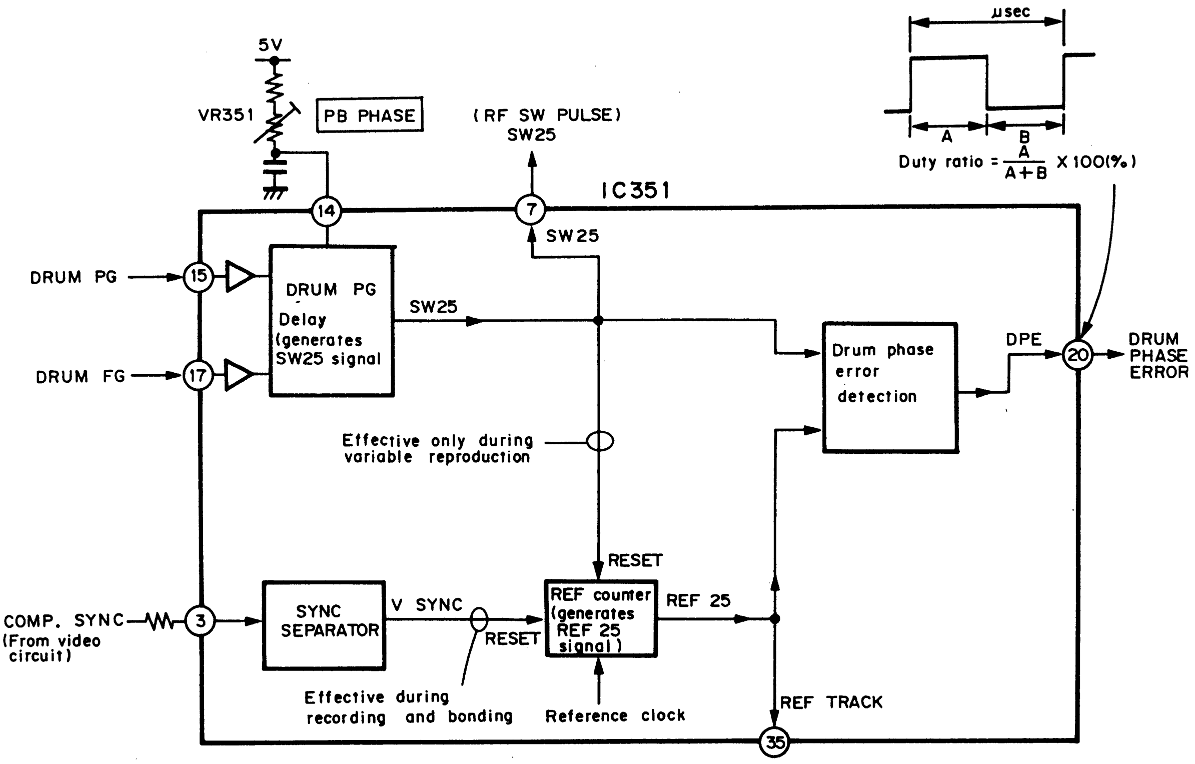
Fig. 6.

The drum speed error is output from Pin 18 by the 8.6 kHz PWM signal.
The PWM signal changes as given below depending upon the drum speed.

| Drum speed | Drum FG cycle | PWM signal duty ratio |
|---|---|---|
| Fast | 1.33 msec or less | 50% or less |
| Correct | 1.33 msec | 50% |
| Slow | 1.33 msec or more | 50% or more |

## 2-4. DRUM PHASE ERROR DETECTION

A SW25 signal is generated by a combination of the drum PG signal and the drum FG signal to phase compare with the REF25 generated by the reference counter for detection of a drum phase error.



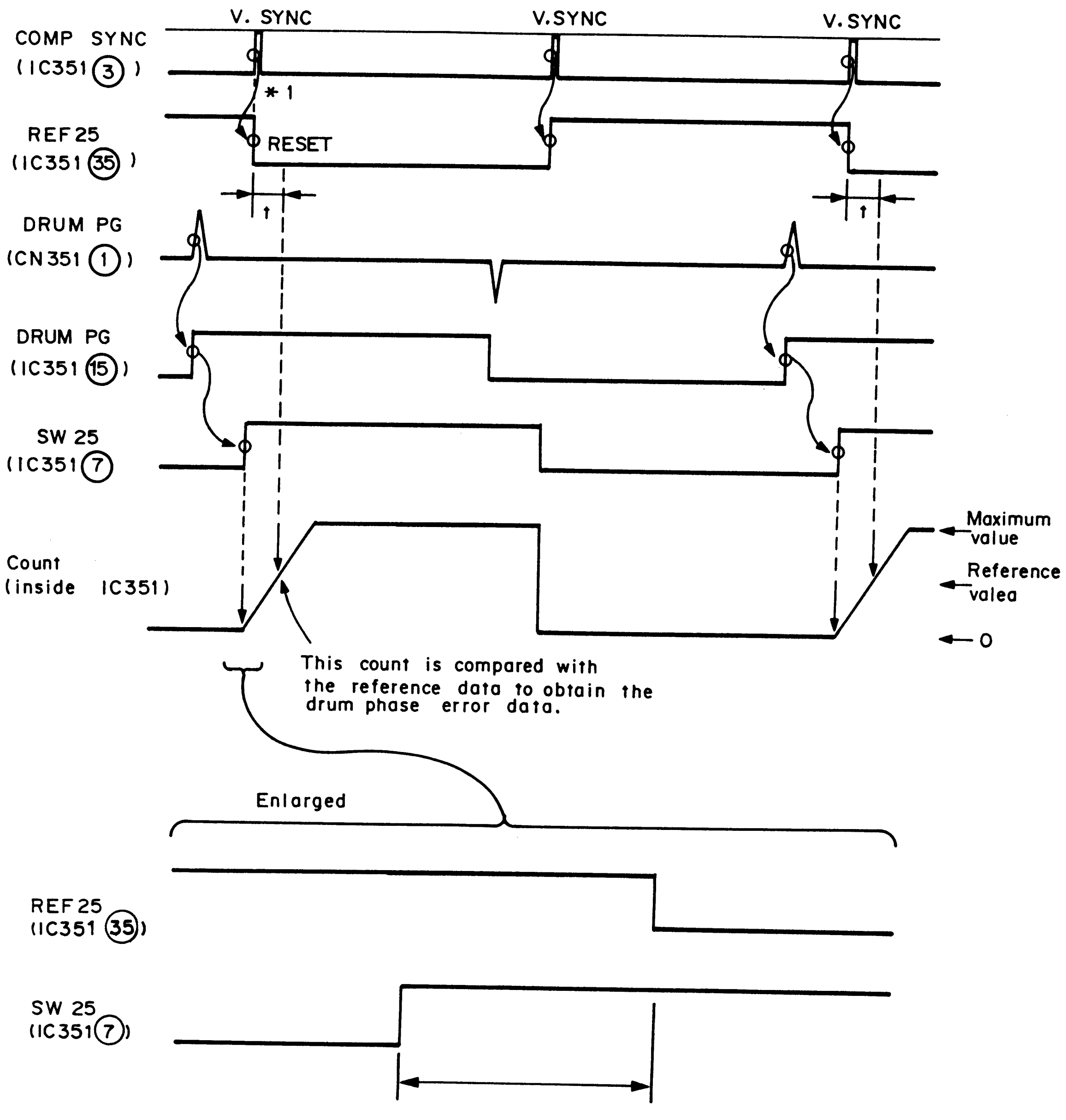
µsec
A
B
Duty ratio = A/(A+B) X 100(%)
5V
VR351
PB PHASE
(RF SW PULSE)
SW25
IC351
14
7
SW25
DRUM PG
15
DRUM FG
17
DRUM PG
Delay
(generates
SW25 signal
SW25
Drum phase
error
detection
DPE
20
DRUM
PHASE
ERROR
Effective only during
variable reproduction
RESET
COMP. SYNC
(From video
circuit)
3
SYNC
SEPARATOR
V SYNC
RESET
REF counter
(generates
REF 25
signal)
REF 25
Effective during
recording and bonding
Reference clock
REF TRACK
35

Fig. 7.

The drum phase error is output from Pin 20 by the 8.6 kHz PUM signal. The PWM signal changes as given below, depending upon the drum phase error.

| Phase of SW25 signal against reference phase | Drum phase error data | PWM signal duty ratio |
|---|---|---|
| Advanced phase | Lager than reference value | 50% or more |
| Equivalent | Equal to reference value | 50% |
| Delayed phase | Smaller than reference value | 50% or less |

*1 The REF25 signal is reset by the V SYNC only for REC (including the EE mode) mode and for connecting bonding recording.


V. SYNC
V.SYNC
V.SYNC
COMP SYNC (IC351 ③)
*1
REF25 (IC351 (35))
RESET
t
t
DRUM PG (CN351 ①)
DRUM PG (IC351 ⑮)
SW 25 (IC351 ⑦)
Count (inside IC351)
Maximum value
Reference valea
0
This count is compared with the reference data to obtain the drum phase error data.
Enlarged
REF25 (IC351 (35))
SW 25 (IC351 ⑦)

phase difference when drum phase is locked
- PB---50 usec
- Variable speed reproduction--- 0 usec (fixed---phase servo is not applied)
- Others---Approx. 410 usec (6.5H)

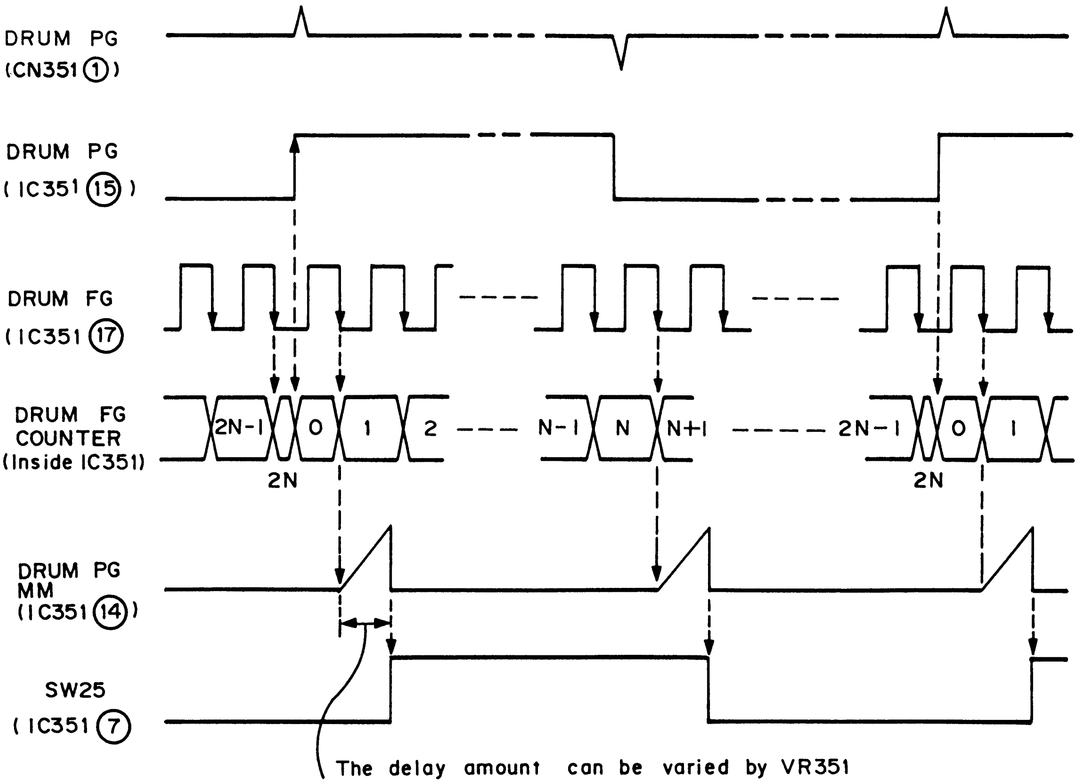
## SUPPLEMENTARY DESCRIPTION

### (1) Generation of SW25 Signal

The SW25 generation circuit consists of a digital counter and analog MMV.

Digital counter : Counts up at the falling edge (‾|_) of the drum FG signal (pulse) and is reset at the rising edge (_|‾) of the drum PG signal (pulse).

Analog MMV : Switching position adjusting delay circuit
Triggered when the count value of the digital counter changes from 0 to 1 or from N to N + 1.
Time constant is determined by the CR connected to Pin 14.
The MMV output (this is a SW25 signal, which corresponds to the RF SW pulse) changes ;
from L to H level when the count value has changed from 0 to 1, and also from H to L level when it has changed from N to N + 1.


DRUM PG
(CN351 ①)
DRUM PG
( IC351 ⑮ )
DRUM FG
( IC351 ⑰
DRUM FG
COUNTER
(Inside IC351)
2N-1
0
1
2
N-1
N
N+1
2N-1
0
1
2N
2N
DRUM PG
MM
(IC351 ⑭)
SW25
( IC351 ⑦

The delay amount can be varied by VR351
(0.7 to 4.0msec)

**(2) Generation of REF25 Signal**

The REF25 signal is generated by counting the reference clock by the 25 Hz pulse inverted at 20 msec cycle.

**[During REC]**

The reference counter is reset by the V sync signal separated from the input video signal, and the reference counter output (REF25 signal) is inverted at the same time.

The design is such that stable operation can be ensured even when the V sync signal is missing, or when noise is introduced.

When the V sync signal is not fed at all, the REF25 signal is also inverted at a cycle of 20 msec just as the maximum count value of the reference counter is set to the number of clocks at a cycle of 20 msec during the playback.

**[During PB]**

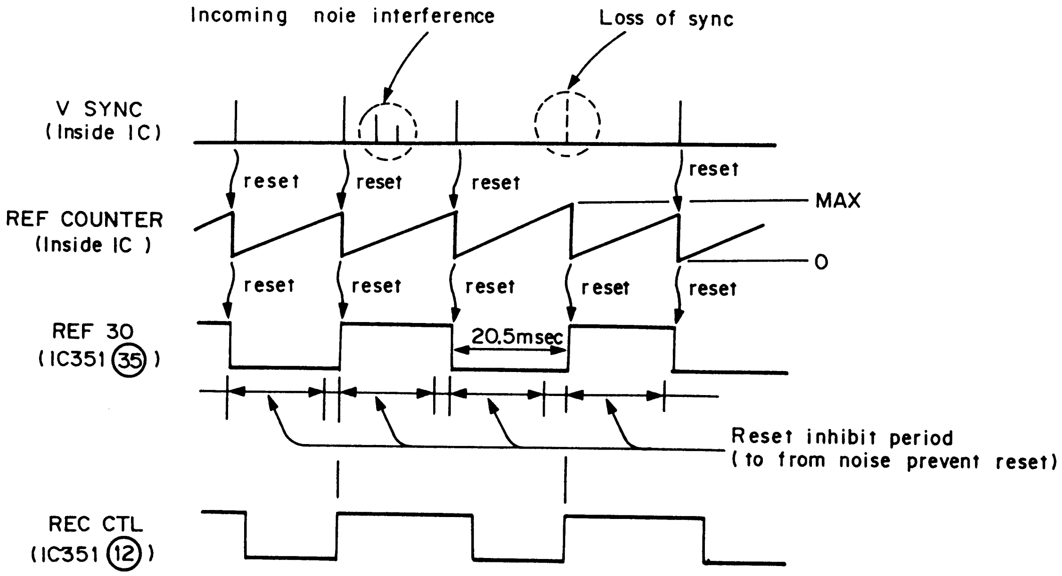
The reset input (V sync signal input) of the reference counter is inhibited. The reference counter counts clocks and is reset to 0 when the count value reaches the maximum value set for playback mode.

The REF25 signal is inverted at a cycle of 20 msec because the maximum value is set to the number of clocks at the 20 msec cycle.

**[During the Variable Speed PB]**

The reference counter is reset at the rising edge (_Г) and the falling edge (ˉL) of the SW25 signal.

Therefore, the SW25 signal and the REF25 signal coincides with each other in phase. (But the phase is reversed.)


Incoming noie interference
Loss of sync
V SYNC
(Inside IC)
reset
reset
reset
reset
MAX
REF COUNTER
(Inside IC)
0
reset
reset
reset
reset
reset
REF 30
(IC351 ㉟)
20.5msec
Reset inhibit period
(to from noise prevent reset)
REC CTL
(IC351 ⑫)

## 2-5. LPF AND DRUM SERVO ERROR MIX AMPLIFIER

1) LPF
The drum error signal is output by the PWM signal. This signal is therefore made a DC error signal by a low-pass filter (LPF).

2) Error Mix Amplifier
The drum speed error and drum phase error signals smoothed by the LPF are mixed with each other to generate a drum motor control signal (DRUM CTL).

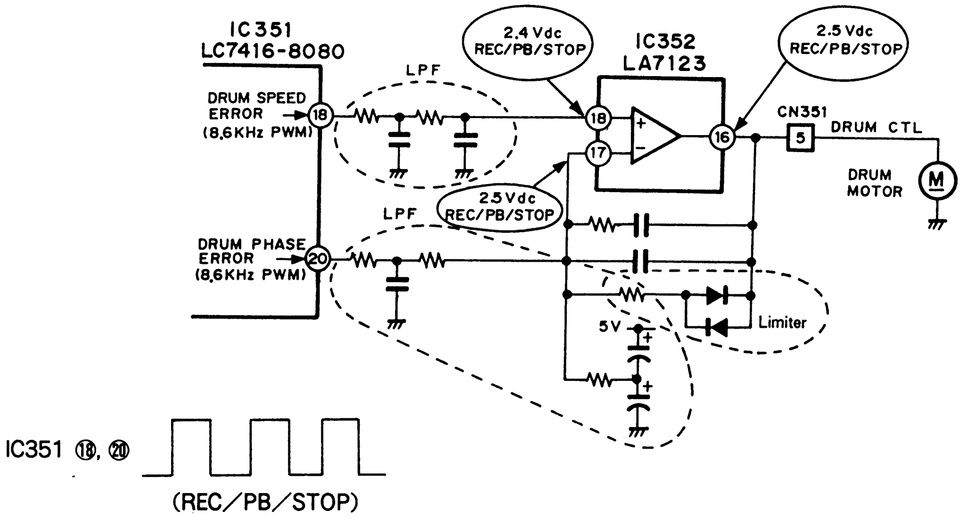

IC351
LC7416-8080
DRUM SPEED ERROR
(8.6KHz PWM)
18
LPF
2.4 Vdc REC/PB/STOP
IC352
LA7123
18
17
16
2.5 Vdc REC/PB/STOP
CN351
5
DRUM CTL
DRUM MOTOR
M
2.5 Vdc REC/PB/STOP
LPF
DRUM PHASE ERROR
(8.6KHz PWM)
20
5V
Limiter
IC351 ⑱, ⑳
(REC/PB/STOP)

Fig. 8.

## 2-6. DRUM $f_H$ CORRECTION

If, during the variable playback mode (CUE, REVIEW, or PAUSE), the drum speed is set at the same speed as that in the normal playback mode, the relative speeds of the video head and the tape are changed. This in turn causes the horizontal sync signal of the monitor TV to go out of synchronization. To prevent this from occurring, the drum speed is varied during the variable playback mode to keep the frequency of the playback H sync signal unchanged.

The drum speed is changed by varying the reference data of the drum speed error detection circuit. (Refer to 2-3.)
Speed change in each mode is as follows.

| Mode | Speed Change (%) |
|---|---|
| PAUSE (STILL) | − 0.5 |
| CUE | + 3.8 |
| REVIEW | − 4.8 |

− : Speed down.
+ : Speed up.

In the above mode, incidentally, the 8.6 kHz PWM signal of the drum phase error output (Pin 20 of IC351) is fixed at 50% of duty. (The drum phase servo does not function.)

## 3. CAPSTAN SERVO

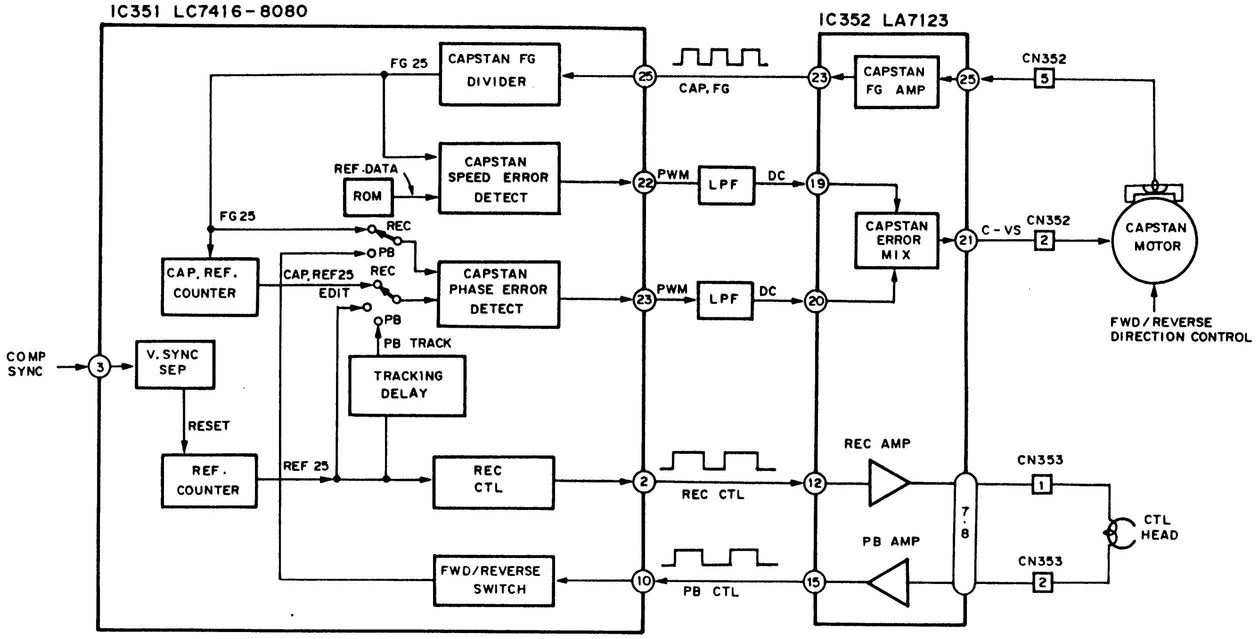

IC351 LC7416-8080
IC352 LA7123
FG 25
CAPSTAN FG DIVIDER
CAPSTAN SPEED ERROR DETECT
REF.DATA
ROM
FG25
REC
PB
CAP. REF. COUNTER
CAP.REF25
REC
EDIT
PB
CAPSTAN PHASE ERROR DETECT
PB TRACK
TRACKING DELAY
COMP SYNC
3
V.SYNC SEP
RESET
REF. COUNTER
REF 25
REC CTL
FWD/REVERSE SWITCH
25
22
23
2
10
CAP. FG
PWM
LPF
DC
PWM
LPF
DC
REC CTL
PB CTL
23
19
20
12
15
CAPSTAN FG AMP
CAPSTAN ERROR MIX
REC AMP
PB AMP
25
21
7
8
CN352
5
C-VS
CN352
2
CAPSTAN MOTOR
FWD/REVERSE DIRECTION CONTROL
CN353
1
CN353
2
CTL HEAD

Fig. 9.

**[Capstan Speed Error]**
A speed error is detected by measuring the cycle of the FG25 signal which is derived by frequency dividing the capstan FG signal fed to Pin 25 and output to Pin 22 by the PWM signal.

**[Capstan Phase Error]**

| | |
|---|---|
| REC ········ | Compares the phase of the FG25 signal with that of CAP REF25 signal. |
| PB ·········· | Compares the phase of the PB CTL signal with that of the PB TRACK signal derived by delaying the REF25 signal. |
| EDIT ······· | Compares the phase of the PB CTL signal with that of the REF25 signal. |

The phase error is output to Pin 23 by the PWM signal.

## 3-1. CAPSTAN FG AMPLIFIER

The capstan FG amplifier waveform-shapes the CAP FG signal (SP mode : approx. 504.4 Hz) generated by rotation of the capstan rotor to a rectangular wave.

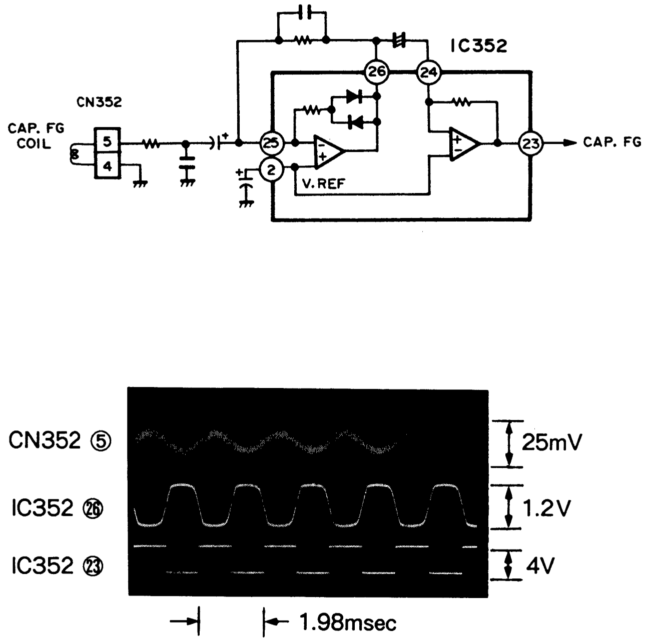

IC352
CN352
CAP. FG COIL
5
4
8
26
24
25
2
23
V.REF
CAP. FG
CN352 ⑤
IC352 ㉖
IC352 ㉓
25mV
1.2V
4V
1.98msec

Fig. 10.

## 3-2. CAPSTAN SPEED ERROR DETECTION

The cycle of the frequency divided CAP FG signal is measured.

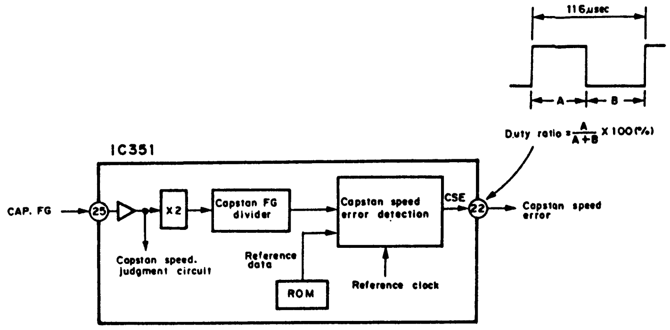

116μsec
A
B
Duty ratio = A/(A+B) x 100(%)
IC351
CAP. FG
25
X2
Capstan FG divider
Capstan speed error detection
CSE
22
Capstan speed error
Capstan speed. judgment circuit
Reference data
ROM
Reference clock

Fig. 11.

The capstan speed error is output from Pin 22 by the PWM signal.

| MODE / TAPE SPEED | REC／PB | PICTURE SEARCH |
|---|---|---|
| SP | 8.6 kHz | 17 kHz |
| LP (attached LP mode model only) | 8.6 kHz | 8.6 kHz |

The duty ratio of the PWM signal varies as given below, depending upon the tape speed.

| Capstan speed | CAPSTAN FG cycle | PWM signal duty ratio |
|---|---|---|
| Fast | t0 or less | 50% or less |
| Correct | t0 | 50% |
| Slow | t0 or more | 50% or more |

The value of t0 for normal reproduction is as follows.

SP mode········0.99 msec (504Hz)
LP mode········1.98 msec (252Hz)
(attached LP mode model only)

## 3-3. CAPSTAN PHASE ERROR DETECTION

The method of detecting a phase error varies with each mode of REC, PB or EDIT.

| Operation mode | Reference signal | Comparison signal |
|---|---|---|
| Playback<br>(including variable speed playback) | The REF 25 signal (drum phase servo reference signal) delayed by the tracking delay circuit (PB TRACK signal) | PB CTL signal |
| Recording | C-REF 25 signal | FG 25 signal |
| Edit | REF 25 signal | PB CTL signal |

**[During REC]**
The C-REF25 signal is phase compared with the FG25 signal derived by frequency dividing the capstan FG signal to generate a capstan phase error signal.

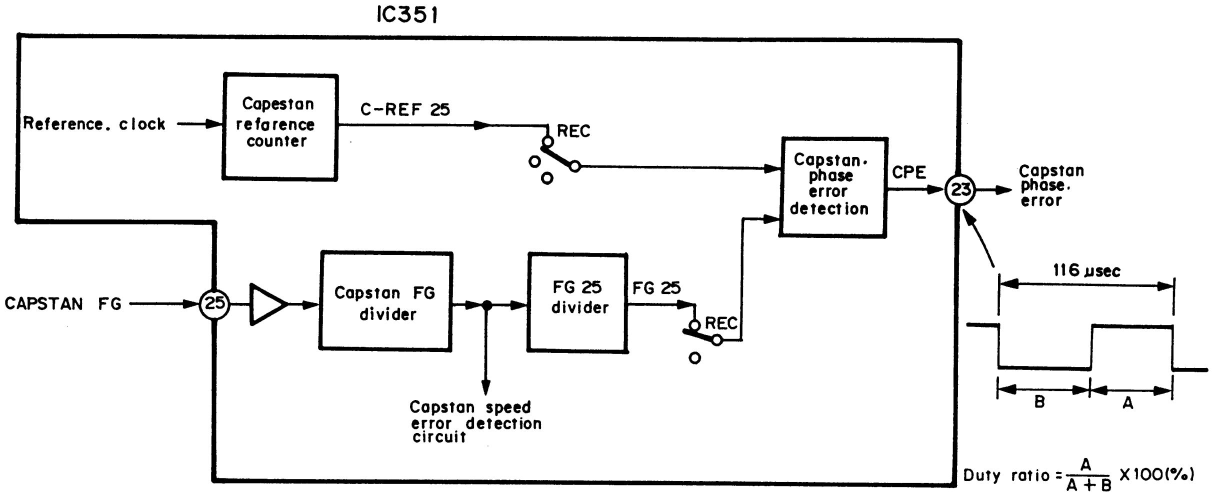

IC351
Reference. clock
Capestan refarence counter
C-REF 25
REC
Capstan. phase error detection
CPE
23
Capstan phase. error
CAPSTAN FG
25
Capstan FG divider
FG 25 divider
FG 25
REC
Capstan speed error detection circuit
116 μsec
B
A
Duty ratio = A/(A+B) X100(%)

Fig. 12.

### (1) CAPSTAN FG DIVIDER

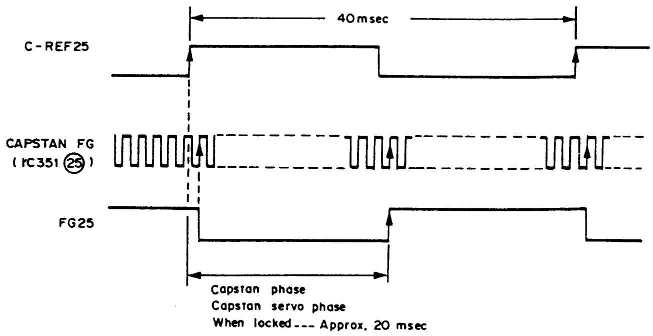
| Mode | SP | LP |
|---|---|---|
| Castan FG frequencies (Hz) | 504.46 | 252.23 |
| Diviation ratio | 1/40 | 1/20 |
| FG 25 frequencies (Hz) | 25.223 | |

### (2) Capstan Phase Error Output

The capstan phase error is output from Pin 23 by the 8.6 kHz PWM signal. The duty ratio of the PWM signal varies as given below, depending upon the phase difference.

| Phase difference between C-REF signal and FG 25 signal | PWM signal duty ratio |
|---|---|
| Smaller than normal | 50% or more |
| Normal | 50% |
| Lager than normal | 50% or less |

### (3) Timing Chart


40msec
C-REF25
CAPSTAN FG (IC351 ㉕)
FG25
Capstan phase
Capstan servo phase
When locked--- Approx. 20 msec

**[During PB]**

The PB track signal derived by delaying the REF25 signal is phase compared with the PB CTL signal to generate a capstan phase error signal.

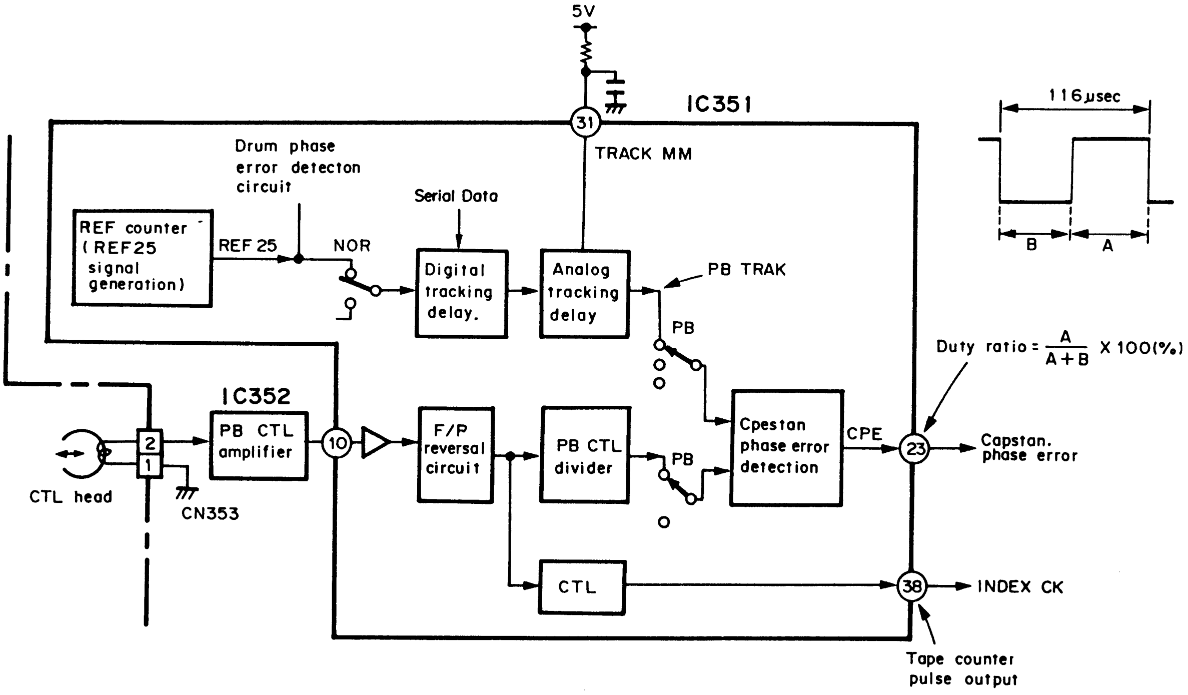

5V
IC351
31
TRACK MM
Drum phase
error detecton
circuit
Serial Data
REF counter
(REF25
signal
generation)
REF 25
NOR
Digital
tracking
delay.
Analog
tracking
delay
PB TRAK
PB
IC352
PB CTL
amplifier
2
1
CTL head
CN353
10
F/P
reversal
circuit
PB CTL
divider
PB
Cpestan
phase error
detection
CPE
23
Capstan.
phase error
CTL
38
INDEX CK
Tape counter
pulse output
116µsec
B
A
Duty ratio = A / A+B X 100(%)

Fig. 13.

**(1) Tracking Delay Circuit**

The amount of delay can be varied by the user for tracking adjustment.

IC351 (LC7416-8080) has a digital delay circuit and an analog delay circuit. In this unit, the amount of delay of the analog delay circuit is fixed to vary the amount of delay of the digital delay circuit only. The amount of digital delay can be varied by the serial data from the system control circuit.

Variable range : 0 ± 15 msec.
Tracking center : approx. 20 msec.

**(2) FWD/REVERSE Inversion Circuit**

The polarity of the PB CTL signal which becomes a comparator signal of the capstan phase servo varies when it is running forward and when it is running in the reverse direction. The polarity is reversed while the capstan servo is running in the reverse direction.

(In the forward operation, the rising edge (⌐) of the PB CTL signal is used for detection of a phase error.)

**(3) PB CTL Frequency Division**

The PB CTL signal is frequency divided as given below so as to fix the position of a noise bar on the CRT screen by operating the capstan phase servo even during the variable playback mode.

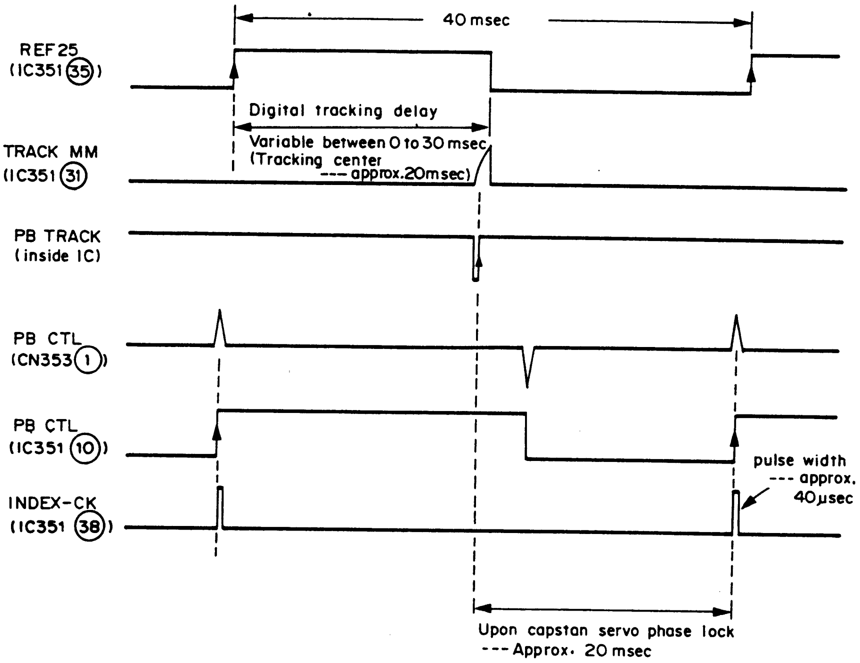
| | PB | PICTURE SEARCH | |
|---|---|---|---|
| | | SP | LP |
| Frequency dividing ratio | 1 | 1/9 | 1/7 |

**(4) Capstan Phase Error Output**

The capstan phase error is output from Pin 23 by the 8.6 kHz PWM signal. The duty ratio of the PWM signal varies as given below, depending upon the phase difference.

| Phase of PB CTL signal (rise) against reference phase PWM signal duty ratio | PWM signal duty ratio |
|---|---|
| Advanced phase | 50% or more |
| Equivalent | 50% |
| Delayed phase | 50% or less |

### (5) Timing Chart


40 msec
REF25
(IC351㉟)
Digital tracking delay
Variable between 0 to 30 msec
(Tracking center
--- approx.20msec)
TRACK MM
(IC351㉛)
PB TRACK
(inside IC)
PB CTL
(CN353①)
PB CTL
(IC351⑩)
pulse width
--- approx.
40μsec
INDEX-CK
(IC351㊳)
Upon capstan servo phase lock
---Approx. 20 msec

**[During EDIT]**

The REF25 signal is phase compared with the PB CTL signal to generate capstan phase error signal. At that time, the REF25 signal is in synchronization with the V sync signal sync separated from the input video signal just as in the case of "During REC".

Therefore , the drum motor rotates in synchronization with the input video signal to cause the tape to run over the track which has already been recorded as if the video head were tracing the record.

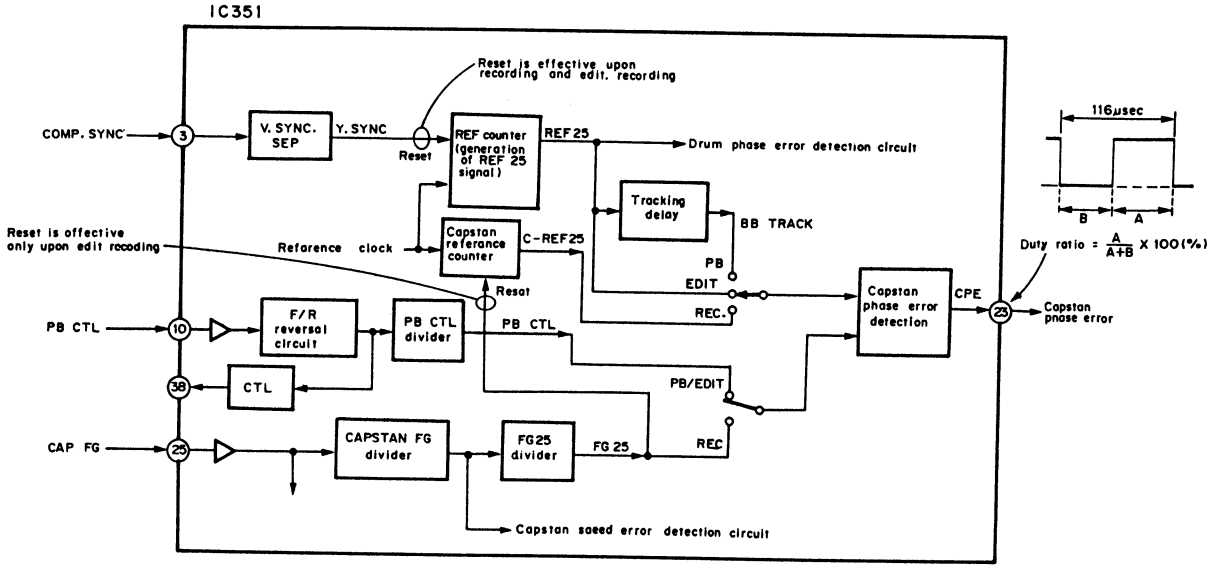

IC351
COMP. SYNC
3
V. SYNC. SEP
Y. SYNC
Reset
Reset is effective upon recording and edit. recording
REF counter (generation of REF 25 signal)
REF 25
Drum phase error detection circuit
Tracking delay
BB TRACK
Reset is effective only upon edit recoding
Referance clock
Capstan referance counter
C-REF25
Resat
PB
EDIT
REC.
Capstan phase error detection
CPE
23
Capstan pnase error
116μsec
B
A
Duty ratio = A/(A+B) X 100(%)
PB CTL
10
F/R reversal circuit
PB CTL divider
PB CTL
38
CTL
PB/EDIT
CAP FG
25
CAPSTAN FG divider
FG25 divider
FG 25
REC
Capstan saeed error detection circuit

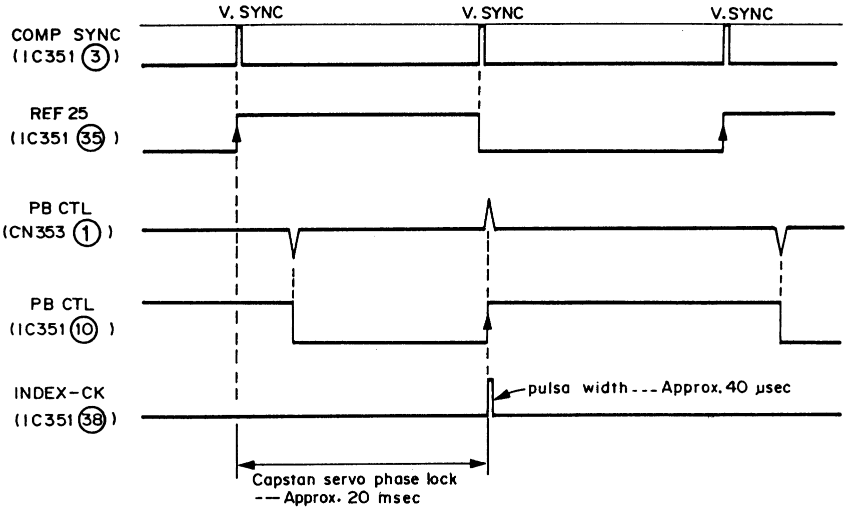
Fig. 14.

**(1) REF Counter (REF25 Signal Producing Circuit)**
The REF25 signal is reset by the V sync signal separated from the input video signal, just as in the case of "During REC". Therefore, this signal is synchronized with the input video signal. The rotating phase of the drum is in synchronization with the input video signal for that reason.

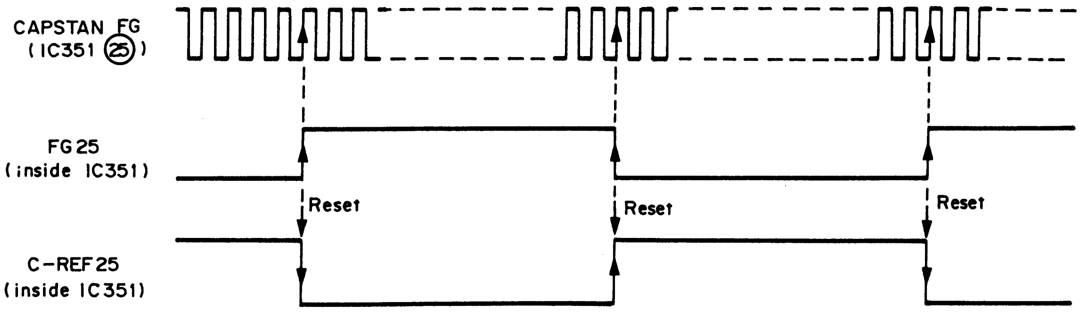
**(2) F/R Inversion Circuit**
The tape runs a little in the reverse direction when the mode is changed from REC to REC PAUSE. The PB CTL signal is inverted during this time.

**(3) Capstan Phase Error Output**
The capstan phase error is output from Pin 23 by the 8.6 kHz PWM signal. As a result, an 8.6 kHz PWM signal of 50% in duty ratio is output when the time difference between the rising edge (↑) of the REF25 signal and the falling edge (↓) of the PB CTL signal is 20 msec.

**(4) Timing Chart**


V. SYNC
V. SYNC
V.SYNC
COMP SYNC (IC351 ③)
REF 25 (IC351 ㉟)
PB CTL (CN353 ①)
PB CTL (IC351 ⑩)
INDEX-CK (IC351 ㊳)
pulsa width --- Approx. 40 µsec
Capstan servo phase lock
--- Approx. 20 msec

**(5) REC PAUSE→REC**
To cause the phase lock of the capstan phase servo to take place earlier, the capstan reference counter is reset by the FG25 signal during a period of phase servo operation in the EDIT mode, to synchronize the C-REF25 signal (reference signal) with the FG25 signal (comparison signal).


CAPSTAN FG (IC351 ㉕)
FG 25 (inside IC351)
Reset
Reset
Reset
C-REF 25 (inside IC351)

## 3-4. LPF AND CAPSTAN SERVO ERROR MIXING AMPLIFIER

### (1) LPF

The capstan error signal is output by the PWM signal.
It is therefore made a DC error signal by the LPF.

### (2) Error Mixing Amplifier

The capstan speed error signal smoothed by the LPF is mixed with the capstan error signal to generate a capstan motor control signal (CAP CTL).

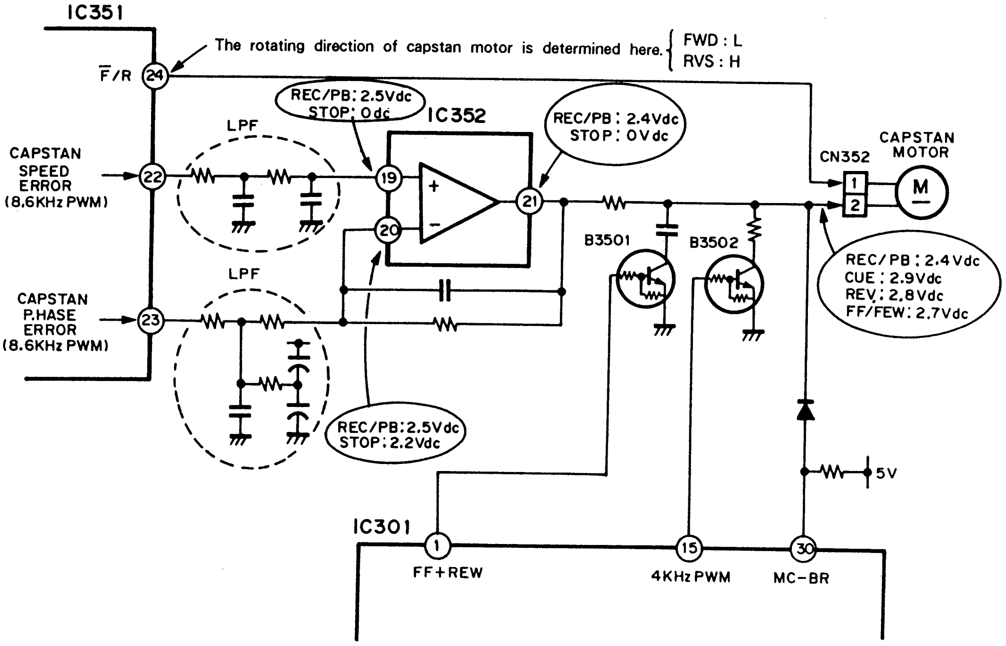

IC351
The rotating direction of capstan motor is determined here.
FWD : L
RVS : H
F̄/R
24
CAPSTAN SPEED ERROR (8.6KHz PWM)
22
CAPSTAN P.HASE ERROR (8.6KHz PWM)
23
LPF
LPF
REC/PB: 2.5Vdc
STOP: 0dc
IC352
19
20
21
REC/PB: 2.4Vdc
STOP: 0Vdc
REC/PB: 2.5Vdc
STOP: 2.2Vdc
B3501
B3502
CN352
1
2
CAPSTAN MOTOR
M
REC/PB: 2.4Vdc
CUE: 2.9Vdc
REV: 2.8Vdc
FF/FEW: 2.7Vdc
5V
IC301
1
15
30
FF+REW
4KHz PWM
MC-BR

Fig. 15.

## 3-5. CTL SIGNAL

The CTL signal causes data to be recorded on the control track to generate a comparison signal of the capstan phase servo during the REC mode.

**[During REC]**
The REC CTL signal is generated from the REF25 signal which is the reference signal of the drum phase servo.

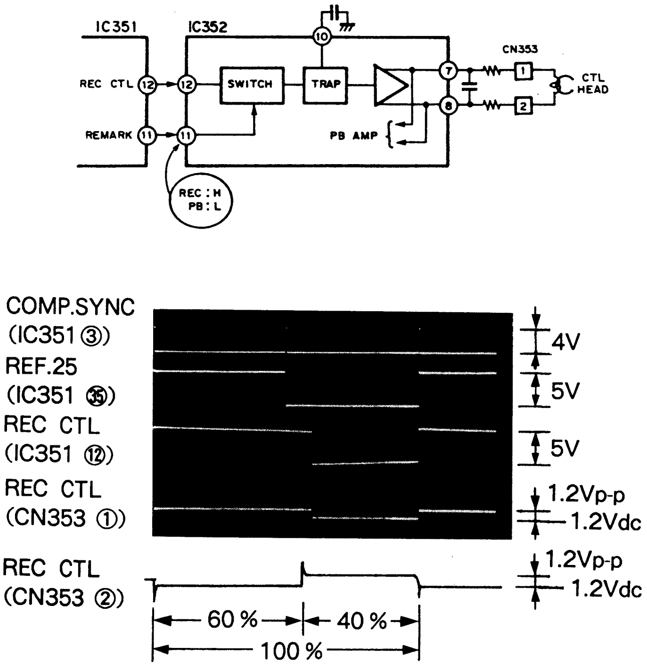

IC351
IC352
REC CTL
12
12
SWITCH
TRAP
10
7
8
CN353
1
2
CTL HEAD
REMARK
11
11
PB AMP
REC : H
PB : L
COMP.SYNC (IC351 ③)
REF.25 (IC351 ㉟)
REC CTL (IC351 ⑫)
REC CTL (CN353 ①)
REC CTL (CN353 ②)
4V
5V
5V
1.2Vp-p
1.2Vdc
1.2Vp-p
1.2Vdc
60 %
40 %
100 %

Fig. 16.

**[During PB]**
The CTL signal played back by the CTL head is waveform shaped to the rectangular wave.

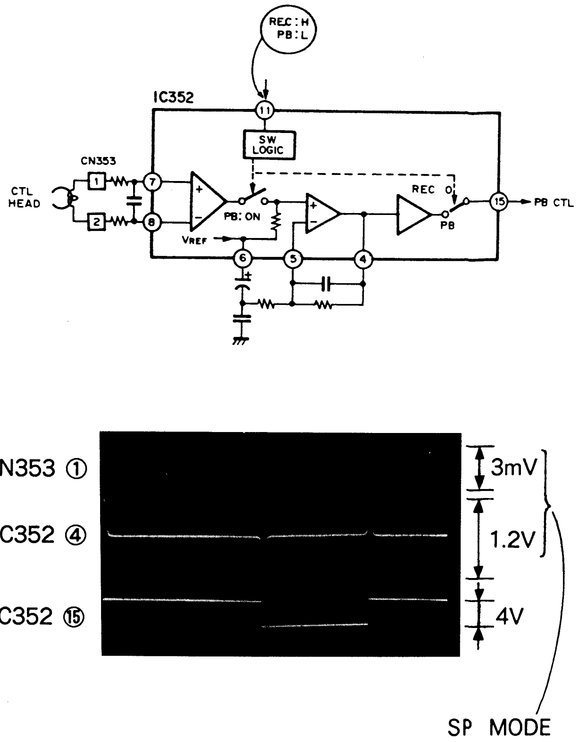

REC : H
PB : L
IC352
11
SW LOGIC
CN353
CTL HEAD
1
2
7
8
PB: ON
VREF
REC
PB
15
PB CTL
6
5
4
CN353 ①
IC352 ④
IC352 ⑮
3mV
1.2V
4V
SP MODE

Fig. 17.

## 4. TAPE SPEED DISCRIMINATION CIRCUIT

[**During REC**]
This circuit discriminates the tape speed data sent from the system control circuit and outputs it from the SP/LP terminal in a binary code of either high or low level.

[**During PB**]
The tape speed is discriminated by the number of capstan FG signals (number of pulses) counted during one cycle of the PB CTL signal. The discrimination results immediately beforehand are held during a still (pause) period or when changing the mode.
The discrimination results are output from the SP/LP terminal in a binary code of either high or low level.

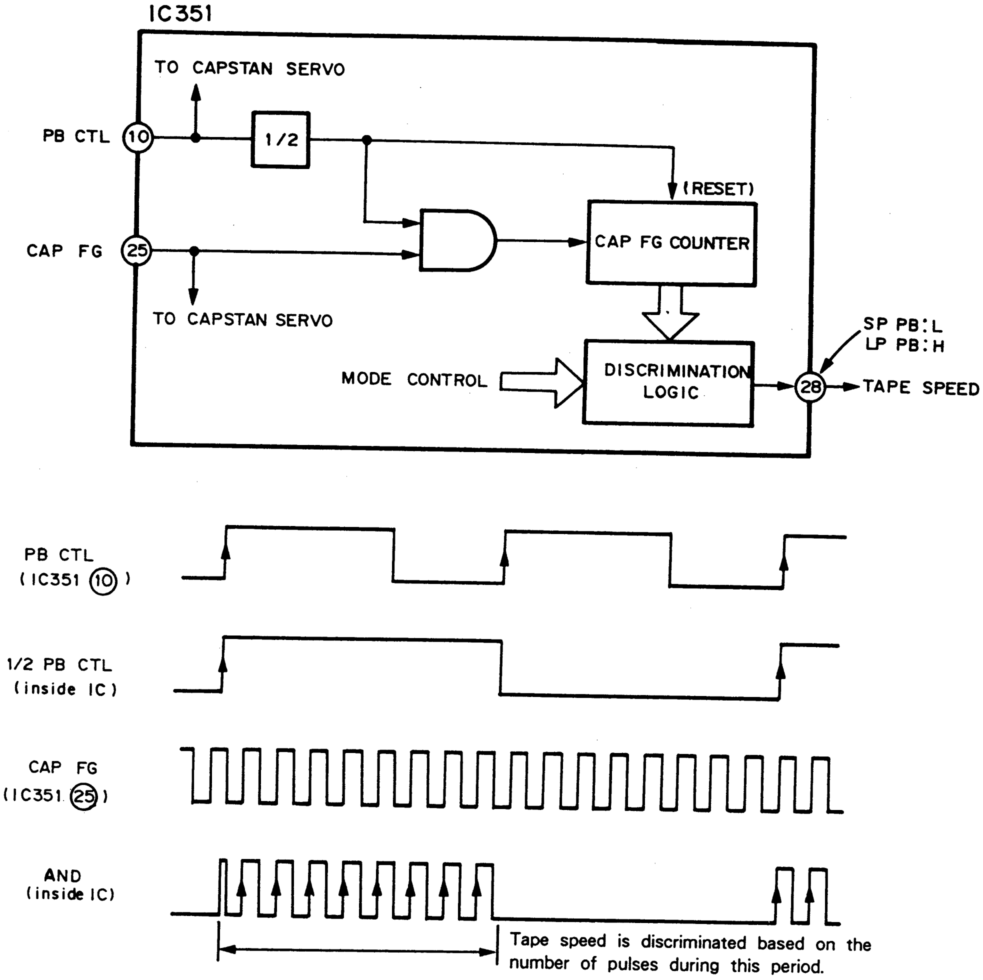

IC351
TO CAPSTAN SERVO
PB CTL ⑩
1/2
(RESET)
CAP FG ㉕
CAP FG COUNTER
TO CAPSTAN SERVO
SP PB:L
LP PB:H
MODE CONTROL
DISCRIMINATION LOGIC
㉘
TAPE SPEED
PB CTL (IC351 ⑩)
1/2 PB CTL (inside IC)
CAP FG (IC351 ㉕)
AND (inside IC)
Tape speed is discriminated based on the number of pulses during this period.

Fig. 18.

## 5. PSEUDO VD SIGNAL

A pseudo VD signal is added to the PB video signal to stabilize vertical synchronization during the special playback mode.
This pseudo VD signal is generated from the SW25 signal, and H sync signal component is also added. Also, since the H sync signal component is generated by sync separation from the PB video signal, the H sync signal component is not added when it cannot be sync separated from the PB video signal (for example, when there is much noise in the PB video signal, or when playing a none-recording type tape).

| Output Level at Pin 4 | Video signal |
|---|---|
| H | Clamped to sync chip level. |
| M | Clamped to pedestal level. |
| L | PB signal is directly output. |

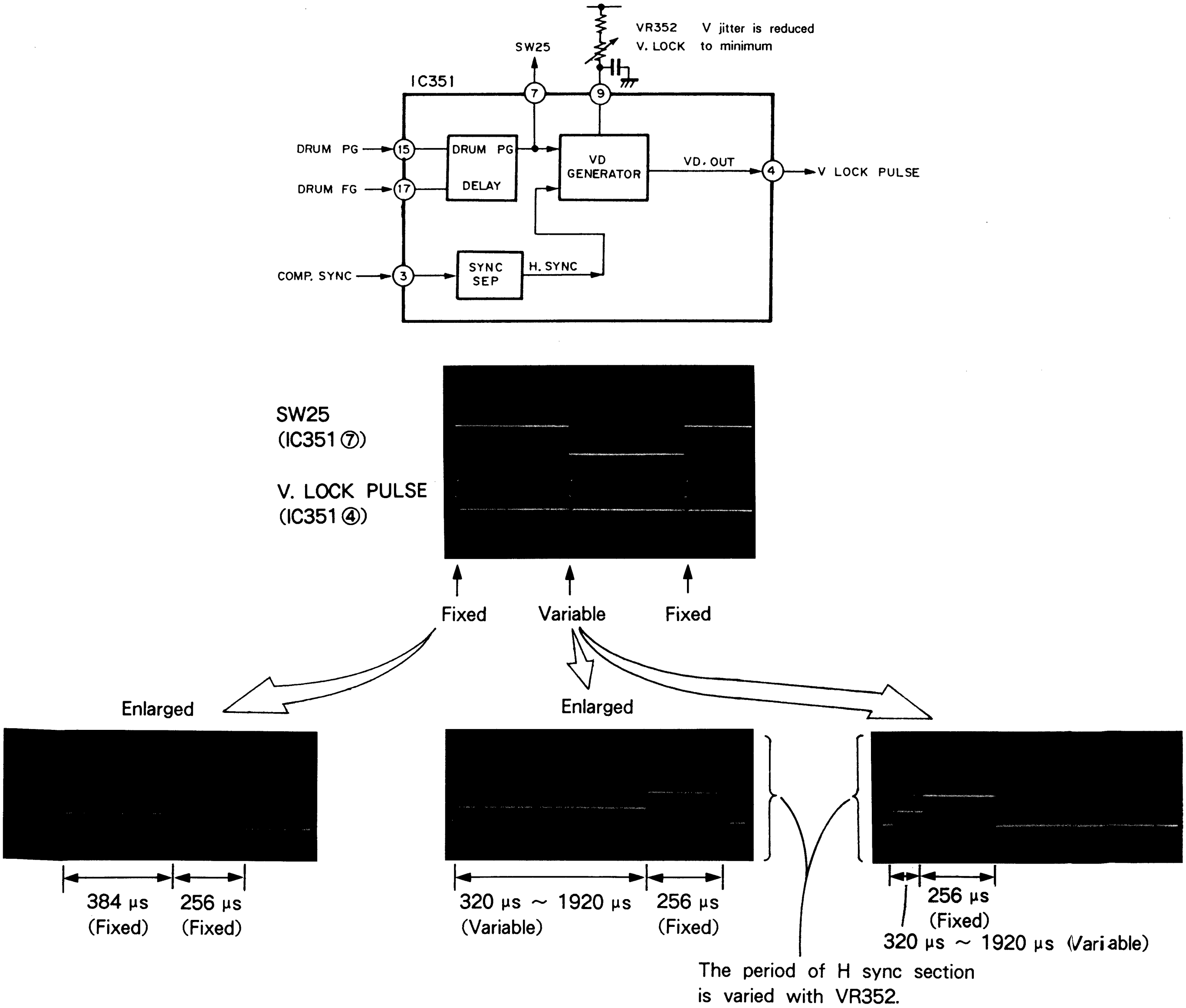

VR352 V. LOCK
V jitter is reduced to minimum
SW25
IC351
7
9
DRUM PG
15
DRUM FG
17
DRUM PG DELAY
VD GENERATOR
VD. OUT
4
V LOCK PULSE
COMP. SYNC
3
SYNC SEP
H. SYNC
SW25 (IC351 ⑦)
V. LOCK PULSE (IC351 ④)
Fixed
Variable
Fixed
Enlarged
Enlarged
384 μs (Fixed)
256 μs (Fixed)
320 μs ~ 1920 μs (Variable)
256 μs (Fixed)
256 μs (Fixed)
320 μs ~ 1920 μs (Variable)
The period of H sync section is varied with VR352.

**Fig. 19.**

# 4. VIDEO CIRCUIT

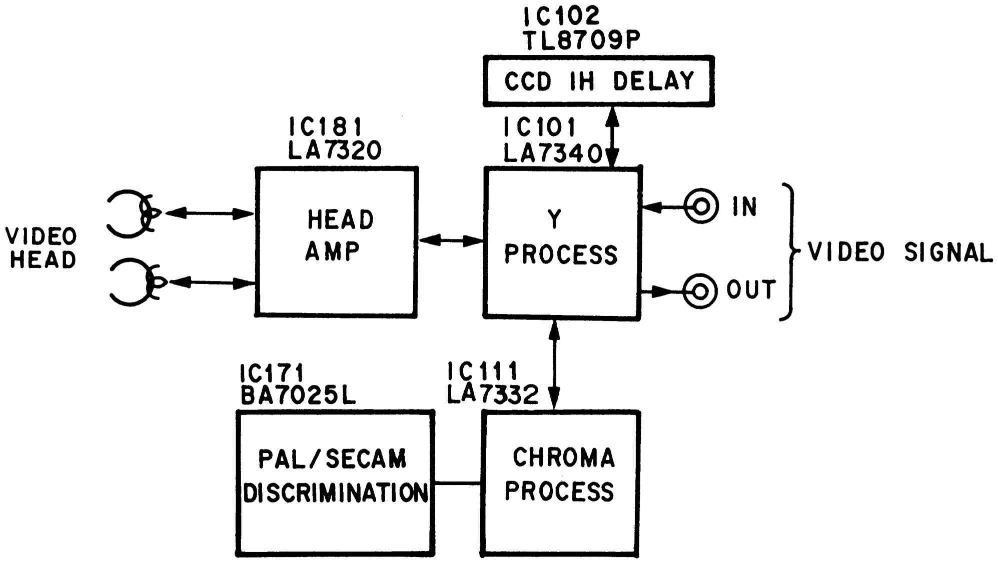

IC102
TL8709P
CCD IH DELAY
IC181
LA7320
IC101
LA7340
VIDEO
HEAD
HEAD
AMP
Y
PROCESS
IN
OUT
VIDEO SIGNAL
IC171
BA7025L
IC111
LA7332
PAL/SECAM
DISCRIMINATION
CHROMA
PROCESS

Fig. 1

The video circuit of this unit is mainly composed of three ICs. These are used for both recording and playback as selected by an internal switch.

| | | |
|---|---|---|
| CP-1 Board | IC101 (LA7340) | Y-PROCESS : AGC, EMPHASIS, FREQUENCY MODULATION (FM) |
| | IC102 (TL8709P) | 1H CCD DELAY FOR Y-SIGNAL NC |
| | IC111 (LA7332) | CHROMA PROCESS : ACC, FREQUENCY CONVERSION |
| VP-1 Board | IC181 (LA7320) | HEAD AMP (2 HEAD) |
| | or (LA7321) | HEAD AMP (3/4 HEAD) |
| VD-1 Board | IC171 (BA7025L) | PAL SECAM DISCRIMINATION(With model equiped MESECAM recording function only.) |
| CP-1 Board | IC161 (LA7221) | VIDEO INPUT SELECT |

# 1. LUMINANCE (Y) SIGNAL RECORDING SYSTEM

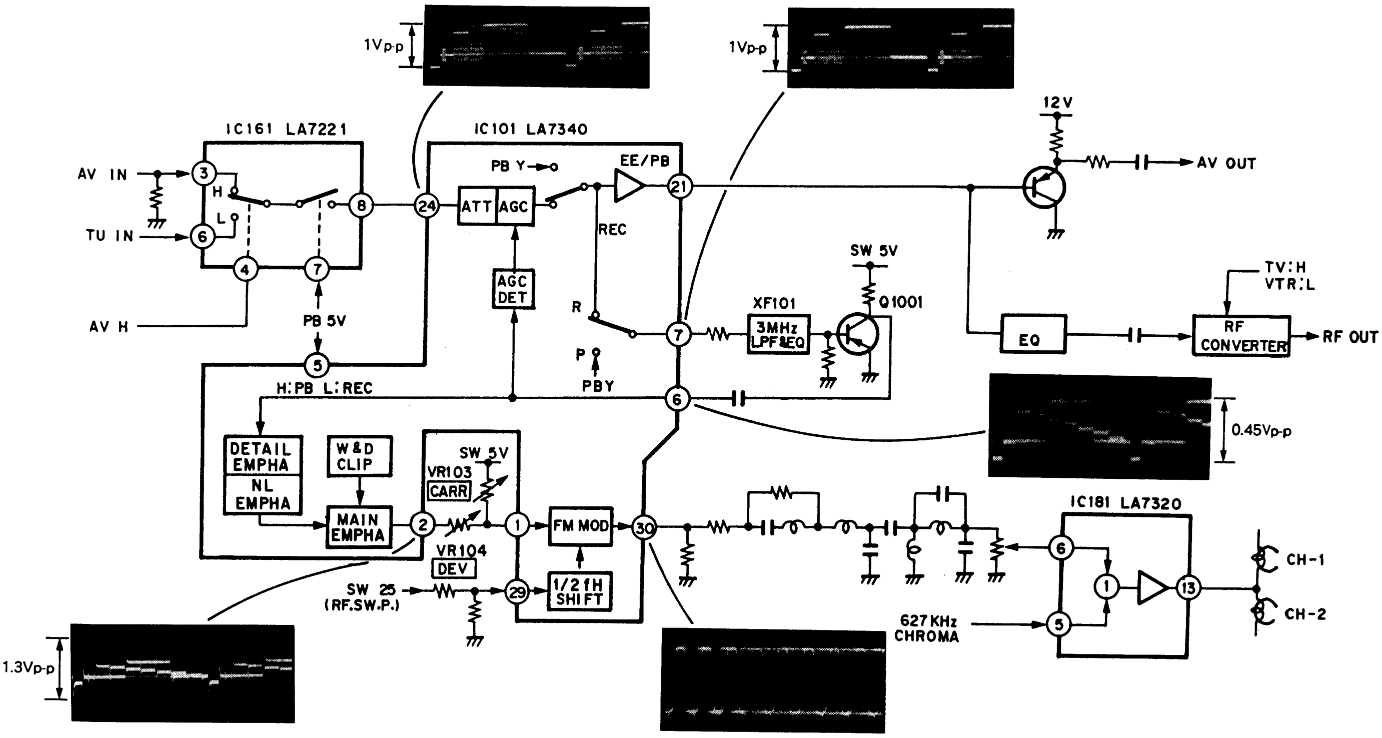

1Vp-p
1Vp-p
IC161 LA7221
IC101 LA7340
12V
AV IN
TU IN
H
L
PB Y
EE/PB
ATT
AGC
REC
AV OUT
AGC DET
SW 5V
TV:H
VTR:L
AV H
PB 5V
R
XF101
3MHz LPF&EQ
Q1001
EQ
RF CONVERTER
RF OUT
P
PBY
H:PB L:REC
0.45Vp-p
DETAIL EMPHA
NL EMPHA
W&D CLIP
MAIN EMPHA
SW 5V
VR103
CARR
VR104
DEV
FM MOD
1/2 fH SHIFT
SW 25 (RF.SW.P.)
IC181 LA7320
CH-1
CH-2
627KHz CHROMA
1.3Vp-p

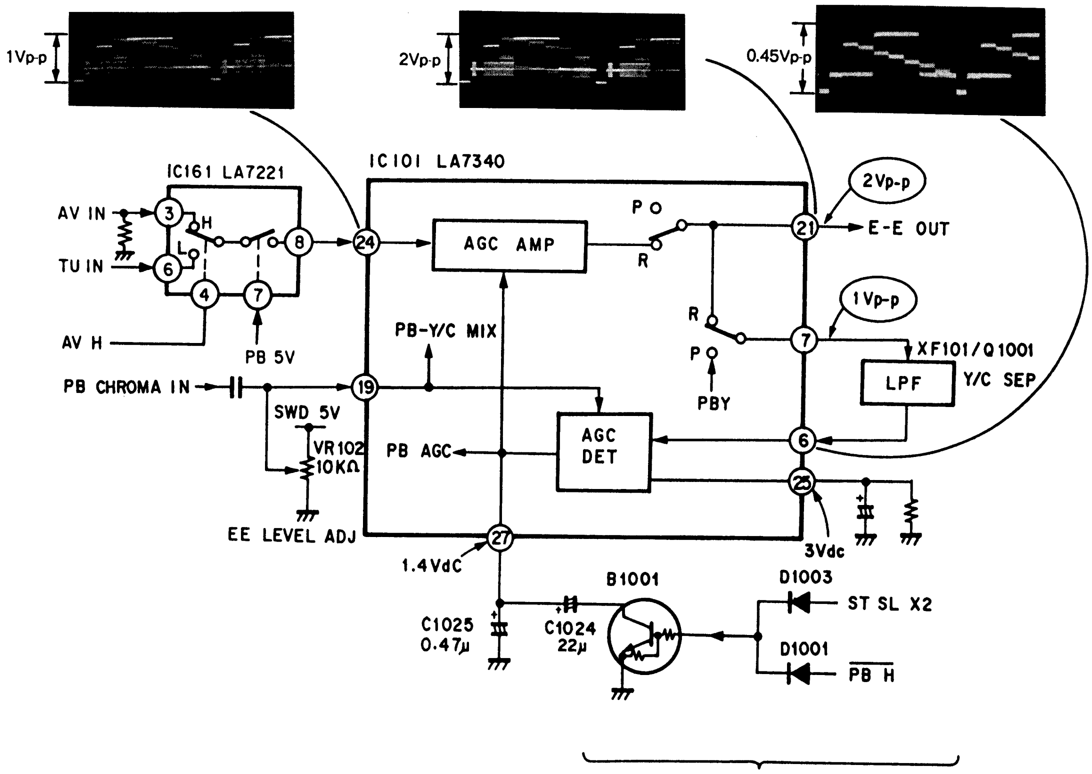
Fig. 2

The tuner (TV) or line signal is input to Pin ㉔ of IC101, its level is adjusted at the AGC circuit, then it is output to Pins ㉑ (E-E system) and ⑦ (recording system). The Y signal is extracted from the recording signal by a LPF and input to Pin ⑥. Then it passes through the detail enhancer, main emphasis and W/D clip circuits and is output to Pin ②. After this, the signal undergoes carrier frequency and deviation adjustment, then it is input to Pin ① and frequency-modulated. In the LP mode, 1/2fH shift is applied to this signal. The frequency-modulated Y signal passes through the equalizer circuit and is sent to the head amplifier IC. The Y-FM signal input to Pin ⑥ of IC181 is mixed with the 627 kHz [(40 + 1/8) fH] chroma signal converted to low frequency internally, and then the resulting signal is sent to the video head through Pin ⑬.

## 1-1. INPUT SELECTION

Switching between the video signal from the tuner and the external video input signal from EURO connector or from the RCA VIDEO IN is performed by input selector IC161. The selected input signal (AV H) is input to Pin ④. A mute terminal (Pin ⑦) is provided to prevent input leaks. It mutes the output (selected) signal in the playback mode.

## 1-2. AGC CIRCUIT


1Vp-p
2Vp-p
0.45Vp-p
IC161 LA7221
IC101 LA7340
AV IN
TU IN
H
L
③
⑥
⑧
④
⑦
AV H
PB 5V
24
AGC AMP
P O
R
21
2Vp-p
E-E OUT
1Vp-p
R
P
7
XF101/Q1001
LPF
Y/C SEP
PBY
PB-Y/C MIX
PB CHROMA IN
19
SWD 5V
VR102
10KΩ
PB AGC
AGC DET
6
25
3Vdc
EE LEVEL ADJ
27
1.4VdC
C1025
0.47µ
C1024
22µ
B1001
D1003
ST SL X2
D1001
PB H

AGC time-constant switching circuit
During recording : 0.47 µF + 22 µF
During playback : 0.47 µF only

Fig. 3

The recording system AGC circuit detects sync signal level and controls video signal level using the sync AGC system. Setting of this level is performed by changing the DC level at Pin ⑲ (EE LEVEL ADJ.).

## 1-3. Y/C SEPARATION (See Fig. 2 and Fig. 4.)

This unit uses an LC low-pass filter (XF101) to extract the Y component.

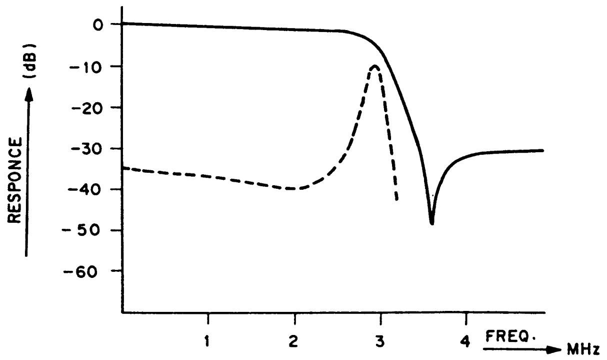


Fig. 4

## 1-4. DETAIL ENHANCER (See Fig. 2 and Fig 5.)

The detail enhancer slightly emphasizes signal components in the 1 to 3 MHz range according to input signal level (nonlinear characteristic) in order to obtain a clear profile reproduction. As shown in Fig. 5, the amount of enhancement increases with higher frequencies and lower input levels. Level is not restored to its original value during playback.

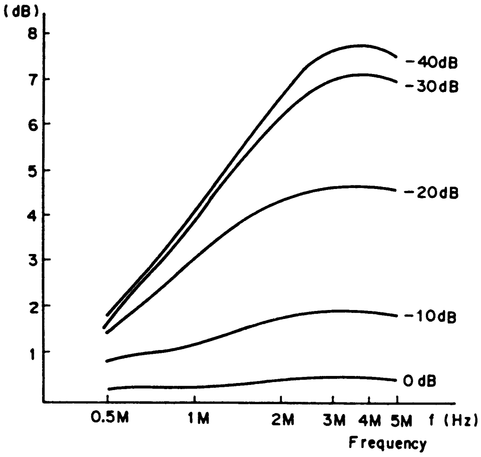


Fig. 5

## 1-5. NONLINEAR PRE-EMPHASIS (See Fig. 2 and Fig. 6.)

The purpose of nonlinear emphasis is to improve the S/N ratio for recording and playback in LP mode. Therefore, it is not applied in SP mode. Like the detail enhancer, also this circuit adjusts the amount of emphasis according to input signal level.

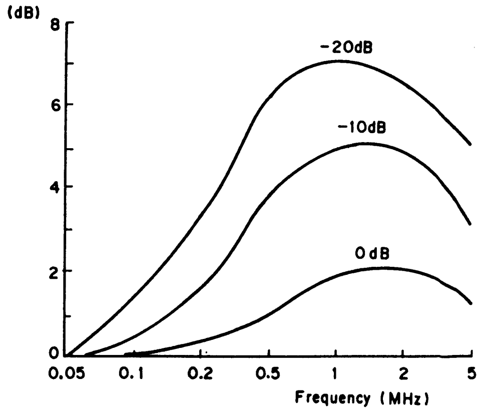


Fig. 6

**Note :** Nonlinear pre-emphasis is not applied in SP mode.

## 1-6. MAIN EMPHASIS (See Fig. 2 and Fig. 7.)

Main emphasis is applied according to the curve shown in Fig. 7 regardless of input level (fixed emphasis).

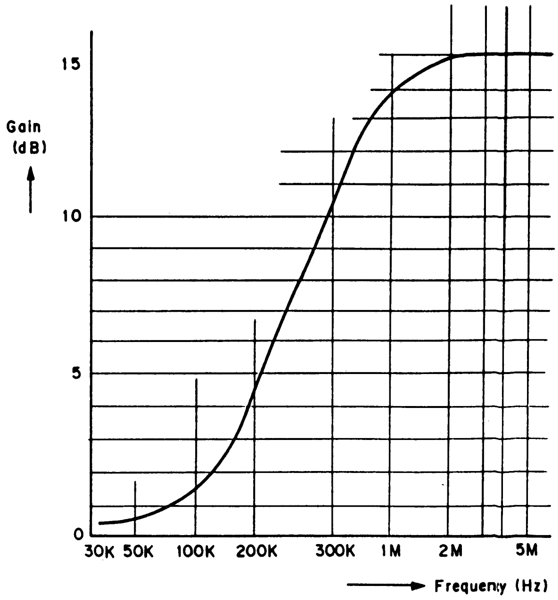


Fig. 7

When the frequency-modulated Y signal is demodulated, the amount of high-frequency noise increases. To solve this, high-frequency components are emphasized when recording, then attenuated when playing back. This suppresses noise components as well, thus improving the S/N ratio.

## 1-7. WHITE CLIP, DARK CLIP
(See Fig. 2 and Fig. 8.)

Overshoot and undershoot spike noise appears when high frequencies are emphasized in the emphasis circuit. If frequency modulation is applied in this condition, spike noise sections would be overmodulated. To prevent this, spike noise tips are cut off.

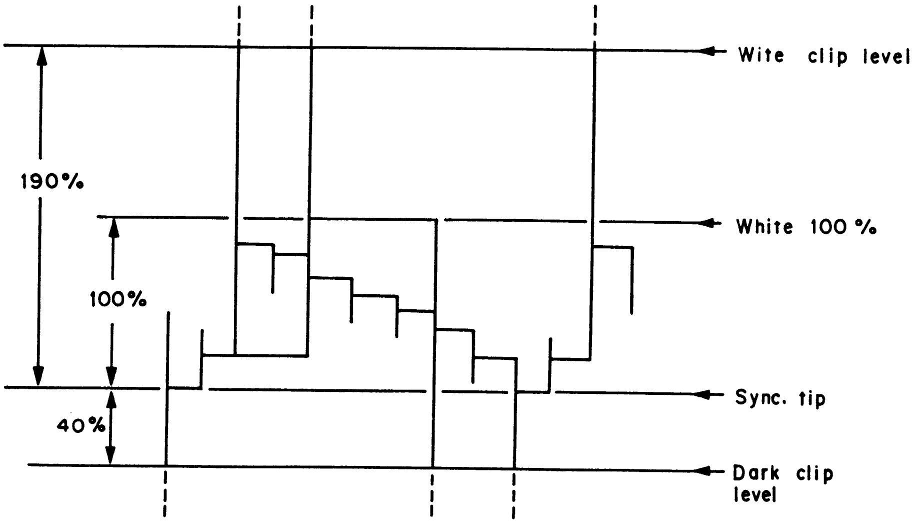

Wite clip level
White 100 %
190%
100%
Sync. tip
40%
Dark clip level

Fig. 8

## 1-8. FREQUENCY MODULATION
(See Fig. 2 and Fig. 9.)

After undergoing white clip and dark clip processing, the Y signal is frequency-modulated according to the characteristic shown in Fig. 9.

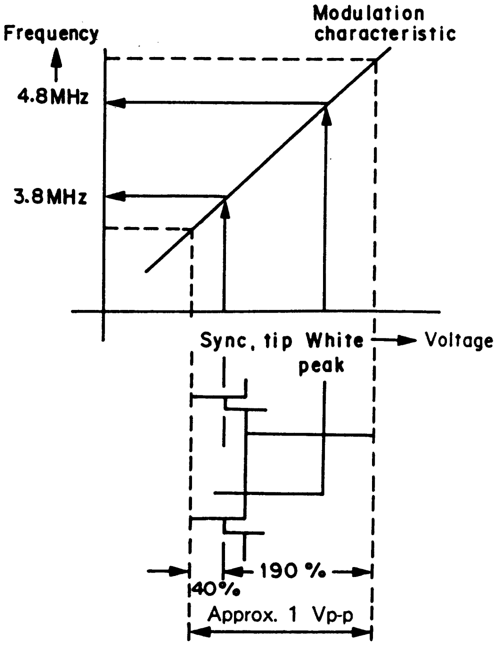
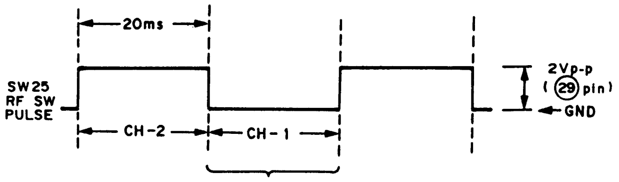

Frequency
Modulation characteristic
4.8MHz
3.8MHz
Sync. tip
White peak
Voltage
190 %
40%
Approx. 1 Vp-p

Fig. 9

**[1/2 fH Carrier Shift] (See Fig. 2 and Fig. 10.)**
In order to remove adjacent track crosstalk during playback mode, channel 1 carrier frequency is turned up approx. 7.8 kHz.
The carrier is turned up approx. 7.8 kHz during L period.


20ms
SW25 RF SW PULSE
CH-2
CH-1
2Vp-p
(㉙pin)
GND

Turn up the carrier approx. 7.8kHz during low.

Fig. 10

## 1-9. HEAD AMPLIFIER CIRCUIT

〔Two-head Type (IC181 : LA7320)〕

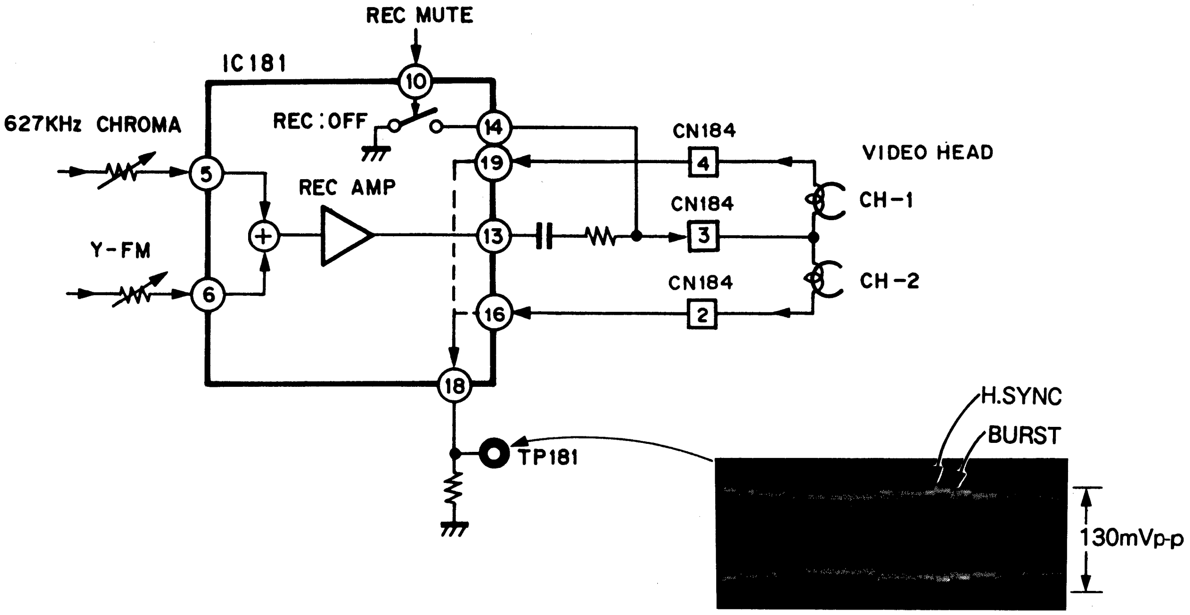
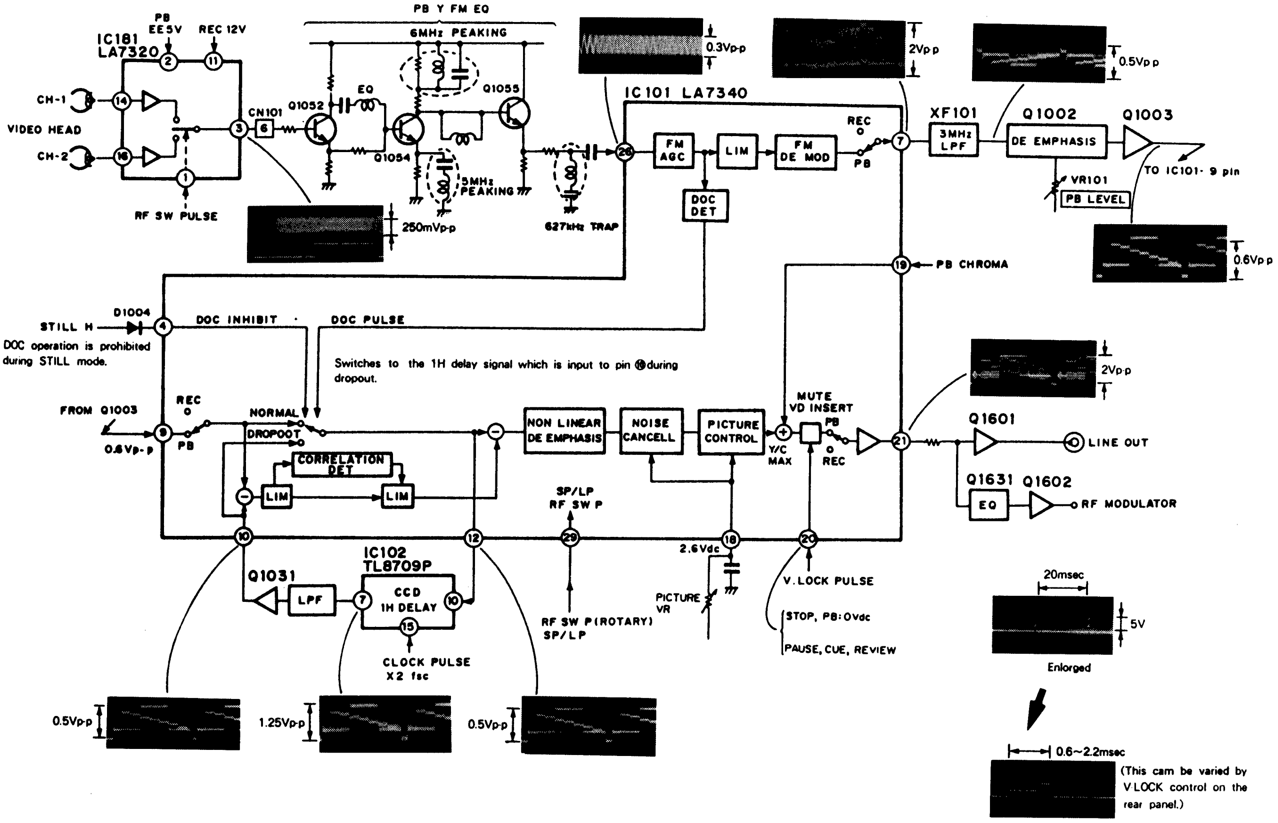

REC MUTE
IC181
627KHz CHROMA
REC : OFF
REC AMP
Y-FM
10
14
19
5
13
6
16
18
CN184
4
CN184
3
CN184
2
VIDEO HEAD
CH-1
CH-2
TP181
H.SYNC
BURST
130mVp-p

Fig. 11

The frequency-modulated Y signal and the chroma signal converted to low frequency are mixed at IC181, then the resulting signal is amplified and sent to the video head through Pin ⑬.

## 2. LUMINANCE (Y) SIGNAL PLAYBACK SYSTEM


IC181
LA7320
PB
EE5V
REC 12V
CH-1
VIDEO HEAD
CH-2
RF SW PULSE
CN101
PB Y FM EQ
6MHz PEAKING
Q1052
EQ
Q1054
Q1055
5MHz PEAKING
627kHz TRAP
250mVp-p
0.3Vp-p
IC101 LA7340
FM AGC
LIM
FM DE MOD
DOC DET
REC
PB
2Vp-p
XF101
3MHz LPF
Q1002
DE EMPHASIS
Q1003
0.5Vp-p
TO IC101- 9 pin
VR101
PB LEVEL
0.6Vp-p
PB CHROMA
D1004
STILL H
DOC INHIBIT
DOC PULSE
FROM Q1003
0.6Vp-p
NORMAL
DROPOOT
CORRELATION DET
LIM
NON LINEAR DE EMPHASIS
NOISE CANCELL
PICTURE CONTROL
MUTE
VD INSERT
Y/C MAX
2Vp-p
Q1601
LINE OUT
Q1631
Q1602
EQ
RF MODULATOR
Q1031
LPF
IC102
TL8709P
CCD
1H DELAY
CLOCK PULSE
X2 fsc
SP/LP
RF SW P
RF SW P(ROTARY)
SP/LP
2.6Vdc
PICTURE VR
V.LOCK PULSE
STOP, PB:0Vdc
PAUSE, CUE, REVIEW
20msec
5V
Enlorged
0.6~2.2msec
0.5Vp-p
1.25Vp-p
0.5Vp-p

DOC operation is prohibited during STILL mode.

Switches to the 1H delay signal which is input to pin ⑩during dropout.

(This cam be varied by V-LOCK control on the rear panel.)

Fig. 13

The RF signal picked up by the video head is input to IC181. There it is switched by SW25 (RF SW pulse), becoming a continuous signal. This RF signal passes through the equalizer circuit, then it is input to Pin ㉖ of IC101. This signal undergoes level adjustment at the FM AGC circuit, then it passes through the limiter circuit and is frequency-demodulated. Unnecessary components are removed from the modulated Y signal by a LPF, then its high-frequency components emphasized during recording are attenuated at the de-emphasis circuit.

The obtained signal passes through the H correlation noise reduction,non-linear de-emphasis and noise canceler circuits and it is mixed with the 4.43 MHz playback chroma signal, becoming the playback video signal. This signal passes through the mute and VD/HD insert circuits, then it is output to Pin ㉑. After this, it passes through the buffer and is output to the RF converter and the LINE OUT terminal.

## 2-1. HEAD AMPLIFIER

**〔Two-head Type〕**

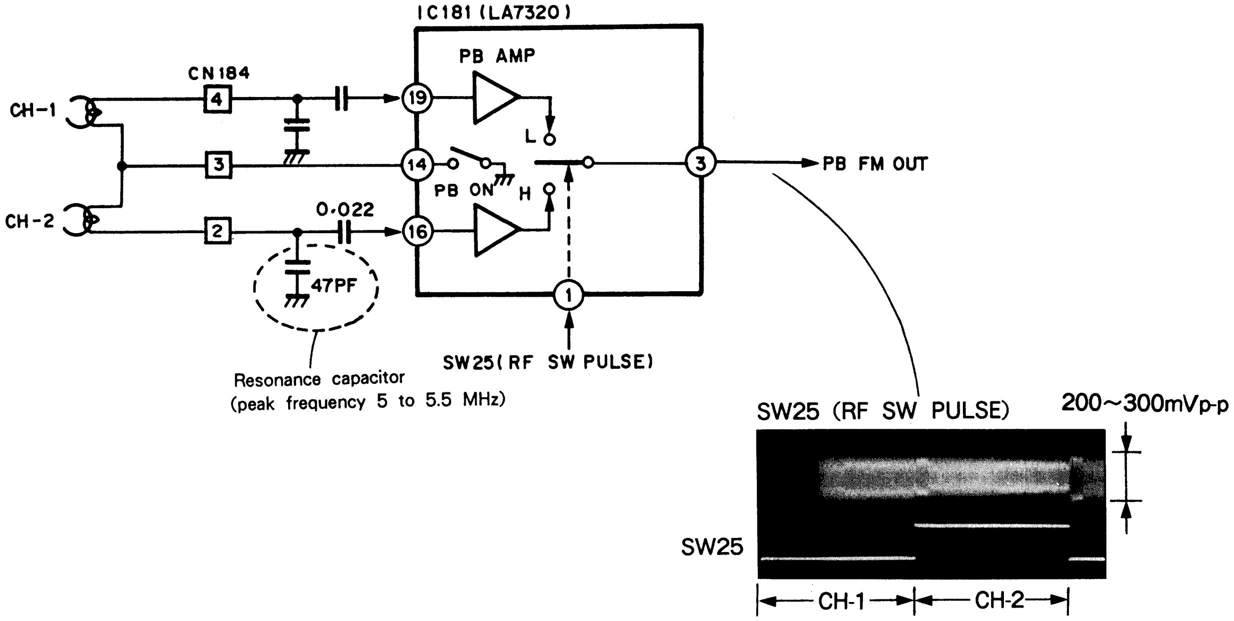

IC181 (LA7320)
PB AMP
CN184
CH-1
CH-2
4
3
2
19
14
16
3
1
L
H
PB ON
0.022
47PF
PB FM OUT
SW25(RF SW PULSE)
Resonance capacitor
(peak frequency 5 to 5.5 MHz)
SW25 (RF SW PULSE)
200~300mVp-p
SW25
CH-1
CH-2

Fig. 14

## 2-2. Playback Y Equalizer

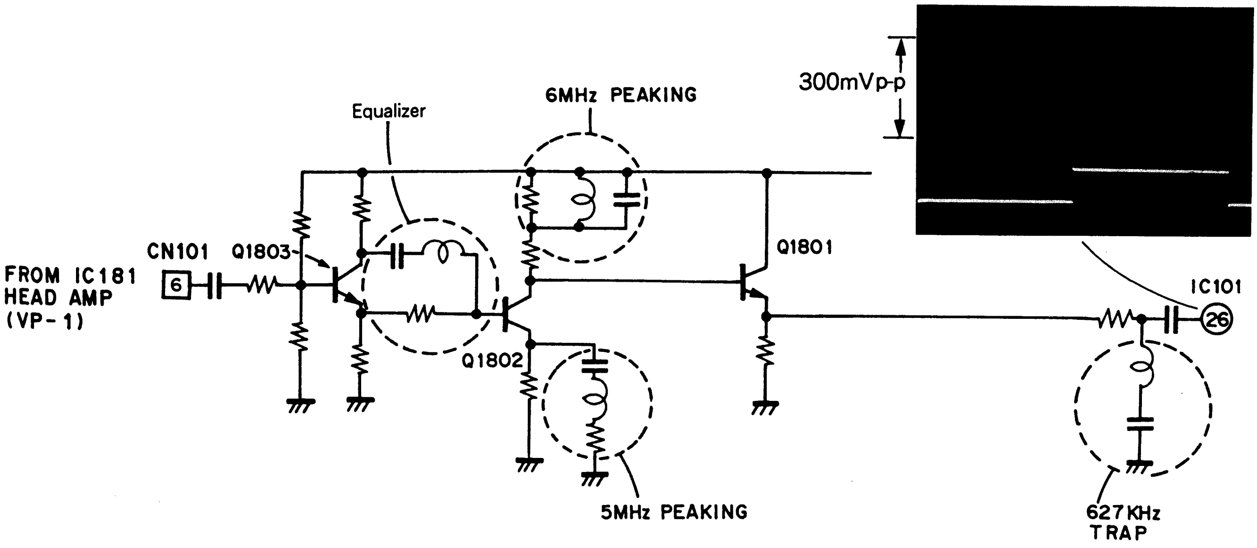

300mVp-p
6MHz PEAKING
Equalizer
CN101
Q1803
FROM IC181
HEAD AMP
(VP-1)
6
Q1802
Q1801
IC101
26
5MHz PEAKING
627KHz
TRAP

Fig. 16

The low-frequency converted chroma components are removed from the playback Y-FM signal by a 627 kHz trap, then its high-frequency components are emphasized by the 5 MHz peaking circuit to flatten its overall frequency characteristic. Phase correction is applied at the equalizer circuit, and high-frequency components are removed at a 7.2 MHz trap.

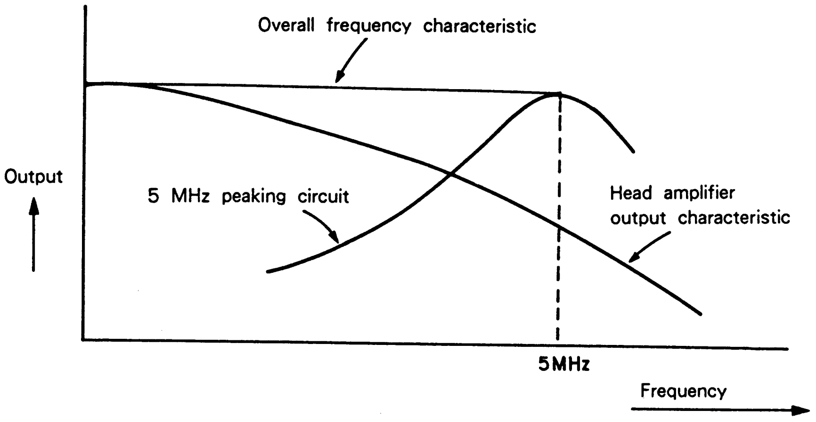


Fig. 17

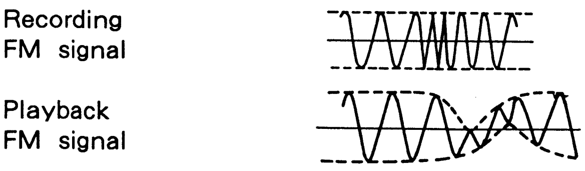
## 2-3. FM AGC (See Fig. 13.)

This circuit eliminates output level fluctuation due to tape speed (LP/SP mode) switching and head unevenness.

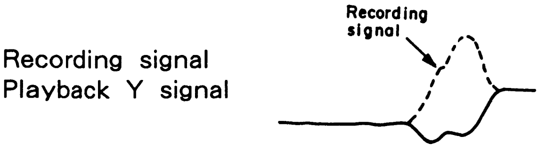
## 2-4. LIMITER (See Fig. 13.)

This circuit removes AM fluctuation and prevents the reversion phenomenon.

**[Reversion Phenomenon]**


Recording FM signal
Playback FM signal

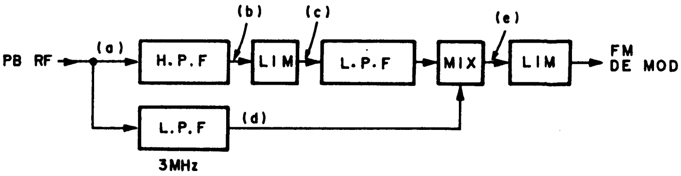
At the point where change occurs from black to white, part of the waveform does not cross zero, and it is distorted like oscillation.

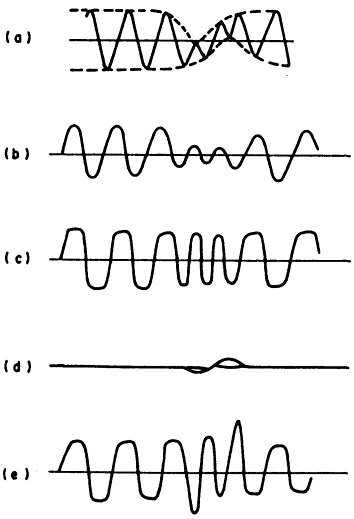

Recording signal
Recording signal
Playback Y signal

Although signal must originally rise as a white peak, it remains at the black level (reversed) because zero-crossing interval appears to widen due to its absence at this point.

**[Double Limiter]**

High-frequency components of the playback RF signal are emphasized by a HPF, thus shaping its waveform so as to prevent the above-mentioned zero-cross distortion. Then the low-frequency component (d) extracted by a LPF is added to the signal to correct phase distortion, and the signal passes through the limiter again to remove its AM fluctuation component.


PB RF
(a)
H.P.F
(b)
LIM
(c)
L.P.F
MIX
(e)
LIM
FM DE MOD
L.P.F
(d)
3MHz



## 2-5. FREQUENCY DEMODULATION, LPF (See Fig. 13 and Fig. 18.)

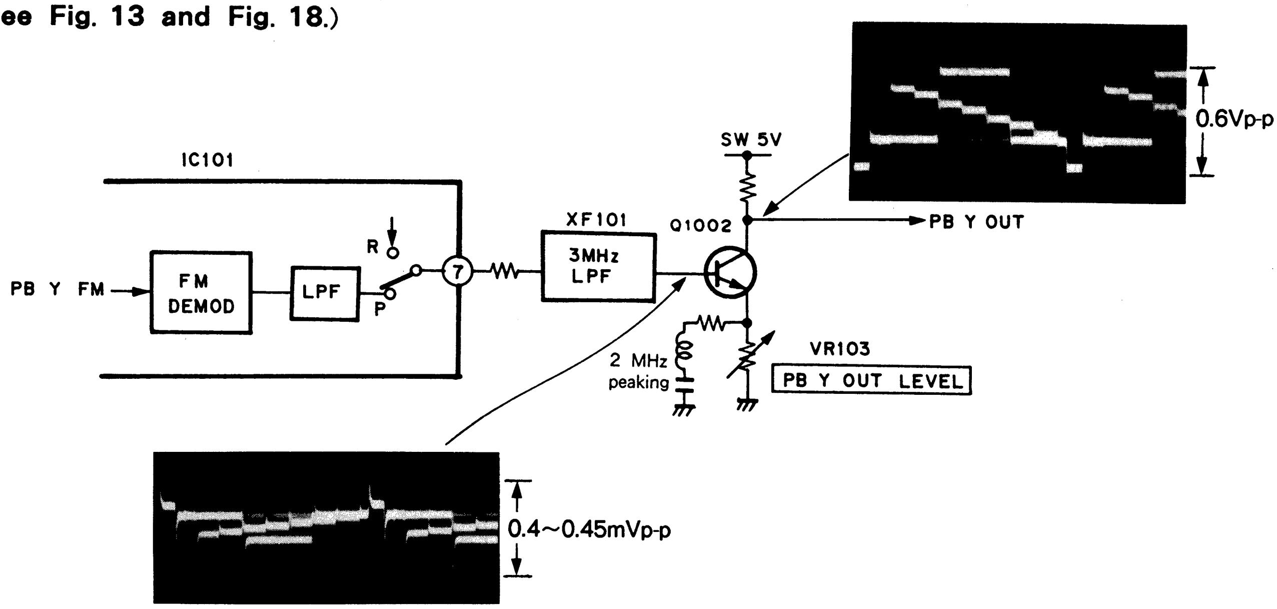

IC101
PB Y FM
FM DEMOD
LPF
R
P
7
XF101
3MHz LPF
Q1002
SW 5V
PB Y OUT
0.6Vp-p
2 MHz peaking
VR103
PB Y OUT LEVEL
0.4~0.45mVp-p

Fig. 18

The frequency-modulated Y signal is turned back to the original video signal. The LPF (XF101) removes unnecessary signal components and integrates the output signal to obtain the demodulated signal.

## 2-6. DE-EMPHASIS (See Fig. 13 and Fig. 19.)

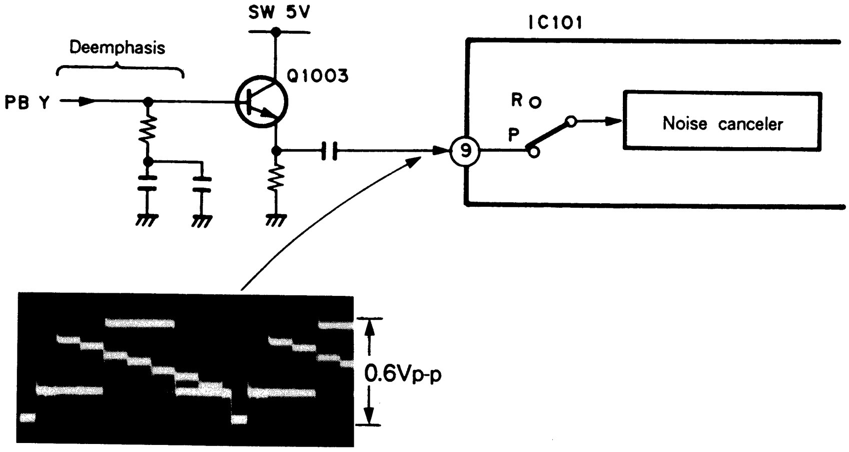

SW 5V
Deemphasis
PB Y
Q1003
IC101
R
P
9
Noise canceler
0.6Vp-p

Fig. 19

The high-frequency components emphasized during recording are attenuated by this circuit. Simultaneously, noise components are suppressed to improve playback Y signal S/N ratio.

## 2-7. DROPOUT COMPENSATION, HORIZONTAL CORRELATION NOISE REDUCTION

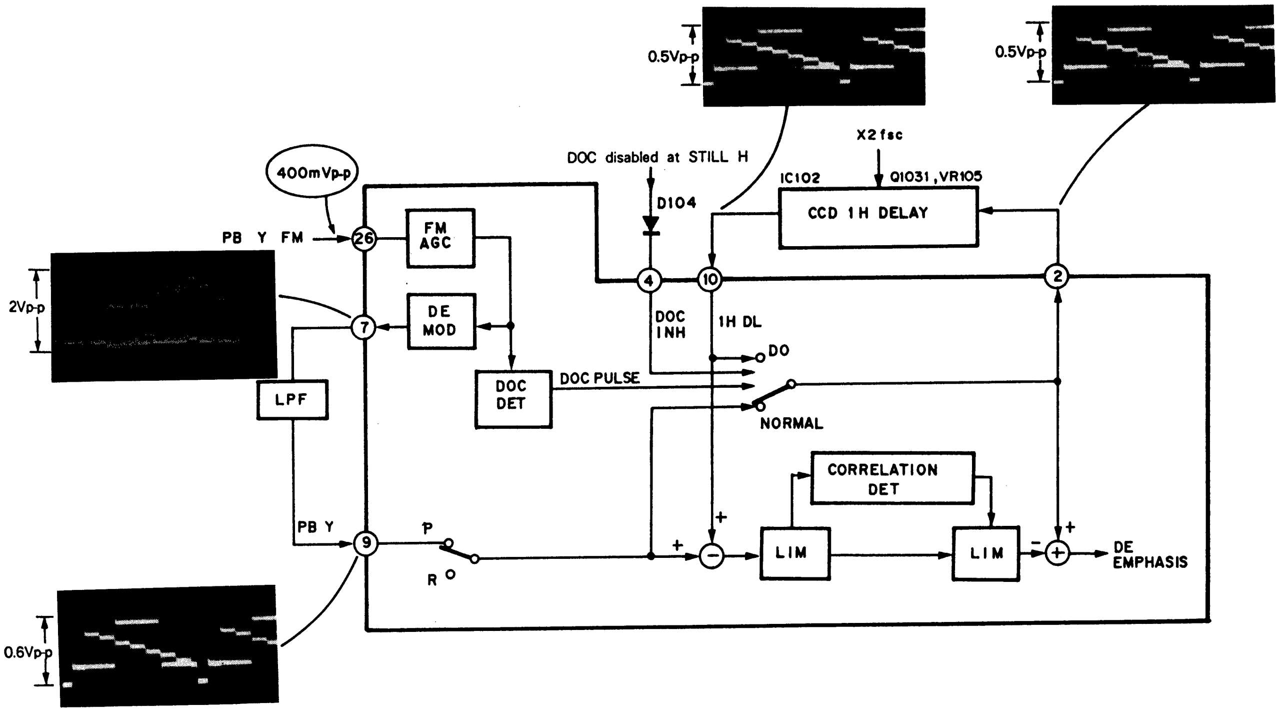

0.5Vp-p
0.5Vp-p
X2 fsc
DOC disabled at STILL H
IC102
Q1031, VR105
400mVp-p
D104
CCD 1 H DELAY
PB Y FM
26
FM AGC
2Vp-p
4
10
2
7
DE MOD
DOC INH
1H DL
DO
LPF
DOC DET
DOC PULSE
NORMAL
CORRELATION DET
PB Y
9
P
R
+
+
LIM
LIM
-
+
DE EMPHASIS
0.6Vp-p

Fig. 20

**[Dropout Compensation]**
After passing through the FM AGC circuit, the Y-FM signal undergoes envelope detection at the DOC DET circuit. When a dropout is found, the IC internal switch is set to the DO side. While the dropout pulse is present, it is replaced by the signal as it was 1H before. In the still mode, voltage at Pin ④ is set to the high level to disable DOC circuit operation. This is to increase the width of the DOC pulse.
which is sent to the system control microprocessor for noise shifting during still-picture playback.

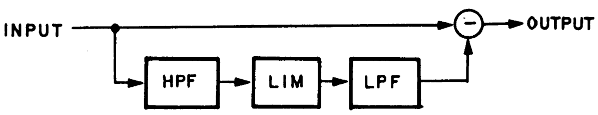
**[Horizontal Correlation Noise Reduction]**
This system uses luminance signal correlation to reduce noise. The playback Y signal input to Pin ⑨ and the 1H DL signal input to Pin ⑩ are compared to each other, and the difference component (equivalent to the noise) is extracted. This component passes through a limiter, then it is added to the playback Y signal with its phase reversed, thus canceling noise. When the signal has no correlation any more, limiter output is lowered to stop correlation DET circuit operation.

## 2-8. NONLINEAR DE-EMPHASIS (See Fig. 13.)

Signal components emphasized during recording are attenuated by the same amount.
**Note** : Nonlinear de-emphasis is not applied in SP mode.

## 2-9. NOISE CANCELER (See Fig. 13.)

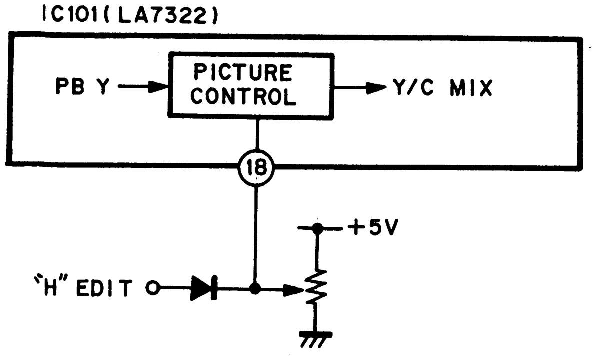
Removes high-frequency noise from the luminance signal.
**[Principle of Operation]**


INPUT
OUTPUT
HPF
LIM
LPF

The high-frequency component is extracted by the high-pass filter, then the signal component is removed by the limiter. The resulting signal is added to the input signal at reverse phase, thus canceling noise.

## 2-10. PICTURE CONTROL, EDIT (See Fig. 13.)

This IC allows to adjust playback picture sharpness by changing DC voltage at Pin ⑱. Furthermore, when pulled-up by approx. 5V it sets the edit mode, turning off the detail enhancer, line NC and picture control circuits.


IC101(LA7322)
PB Y
PICTURE CONTROL
Y/C MIX
18
+5V
"H" EDIT

## 2-11. Y/C MIX (See Fig. 13.)

This circuit mixes the 4.43 MHz chroma playback signal with the Y signal, producing the video signal.

## 2-12. MUTE, VD INSERT (See Fig. 13 and Fig. 21.)

This circuit mutes output immediately after the playback mode is set and inserts a dummy vertical sync signal during variable speed playback, among other functions.

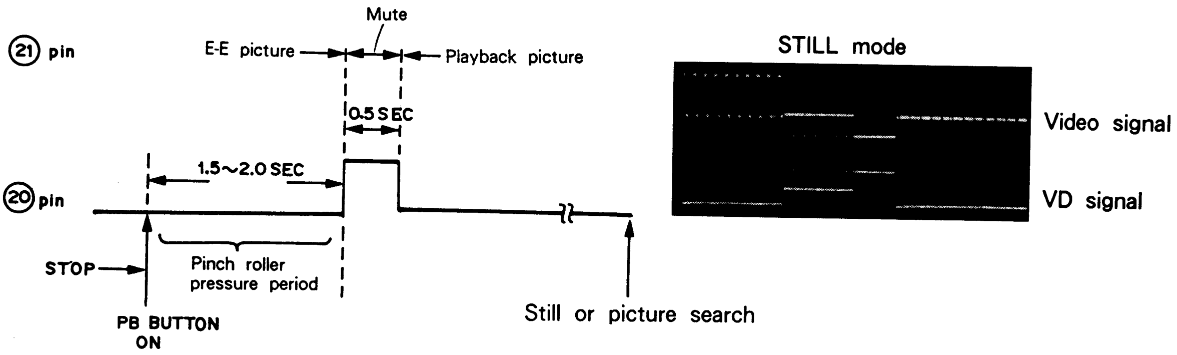

㉑ pin
E-E picture
Mute
Playback picture
0.5 SEC
1.5~2.0 SEC
⑳ pin
STOP
Pinch roller pressure period
PB BUTTON ON
Still or picture search
STILL mode
Video signal
VD signal

Fig. 21

**[Explanation of Pin ⑳]**
Pin ⑳ is used to control the insertion of MUTE, HD and VD signals. It responds to the following three levels :
"L" ··· The input signal is output as it is.
"M" ··· Pedestal mute (the output signal is fixed to the pedestal level)
"H" ··· Sync-tip mute (the output signal is fixed to the sync-tip level)

As shown in Fig. 21, level is normally "L", changing to "H" at the beginning of playback to mute the output signal and prevent the output of irregular sync picture and sound. During the still and picture search modes, a dummy VD signal is inserted to prevent vertical sync distortion.

# 3. CHROMA SIGNAL PROCESSING CIRCUIT

Chroma signal processing is performed at IC111 (LA7332) for both recording and playback.
The chroma signal processing circuit comprises two signal paths ; one for the chroma signal itself and the other for control signals. These will be called the signal system and the control system, respectively, in the following explanations.

## 3-1. RECORDING MODE

◦ REC MODE (IC111 : LA7332 )

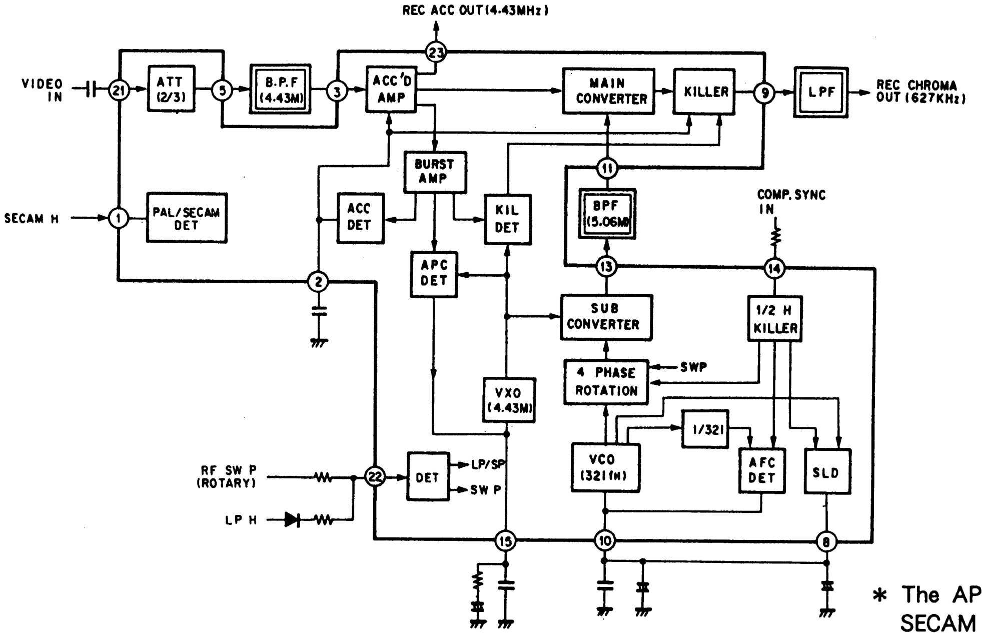

REC ACC OUT (4.43MHz)
VIDEO IN
21
ATT (2/3)
5
B.P.F (4.43M)
3
ACC'D AMP
23
MAIN CONVERTER
KILLER
9
LPF
REC CHROMA OUT (627KHz)
SECAM H
1
PAL/SECAM DET
ACC DET
BURST AMP
KIL DET
11
BPF (5.06M)
COMP. SYNC IN
APC DET
2
13
14
SUB CONVERTER
1/2 H KILLER
4 PHASE ROTATION
SWP
VXO (4.43M)
1/321
VCO (321fH)
AFC DET
SLD
RF SW P (ROTARY)
LP H
22
DET
LP/SP
SW P
15
10
8

Fig. 22

* The APC loop is not used for SECAM signal processing (only for AFC control). 4-phase rotation is not used either.

Chroma signal flow in the recording mode is as follows.
The composite video signal to be recorded passes through C1118 (100 pF), it is input to Pin ㉑, has its level reduced by approx. 2/3 times and is output from Pin ⑤. Then it passes through a 4.43 MHz BPF (Pins ⑥, ⑦ and ⑧ of XF111), only the chroma signal is extracted and input to Pin ③. This signal is sent to the ACC amplifier. Gain of this device is controlled by the DC voltage at Pin ②. Its output is sent to the main converter and to the level detector (ACC DET.). The output from this detector is smoothed by the filter capacitor (C1101, 0.022 µF) attached to Pin ②, then it is fed back into the ACC amplifier to keep the output burst level of this amplifier constant.
The chroma signal, converted to 627 kHz by the main converter, passes through the killer circuit and is output from Pin ⑨. Its unnecessary components are then removed by a 1.4 MHz LPF (Pins ③, ④ and ⑤ of XF111), it passes through the buffer amplifier (Q1101) and is sent to VP-1.

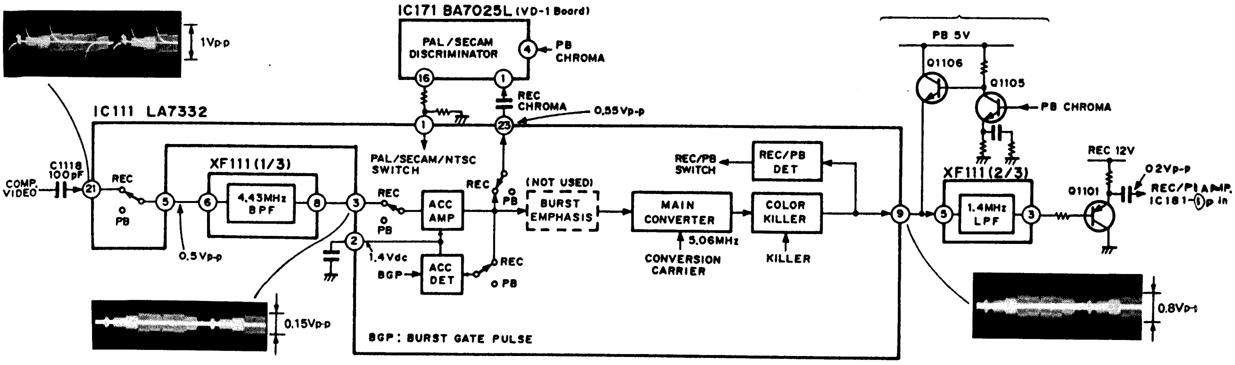

1Vp-p
IC171 BA7025L (VD-1 Board)
PAL/SECAM DISCRIMINATOR
4
PB CHROMA
16
1
REC CHROMA
0.55Vp-p
IC111 LA7332
1
23
COMP. VIDEO
C1118 100pF
21
REC
PB
5
XF111 (1/3)
6
4.43MHz BPF
8
3
0.5Vp-p
PAL/SECAM/NTSC SWITCH
REC
PB
ACC AMP
REC
PB
(NOT USED)
BURST EMPHASIS
2
1.4Vdc
BGP
ACC DET
REC
PB
0.15Vp-p
BGP : BURST GATE PULSE
REC/PB SWITCH
REC/PB DET
MAIN CONVERTER
5.06MHz CONVERSION CARRIER
COLOR KILLER
KILLER
9
PB 5V
Q1106
Q1105
PB CHROMA
XF111 (2/3)
5
1.4MHz LPF
3
REC 12V
Q1101
0.2Vp-p
REC/PB AMP. IC181-①p in
0.8Vp-p

Fig. 23

## 3-2. PLAYBACK MODE

°PB MODE (IC111 :LA7332)

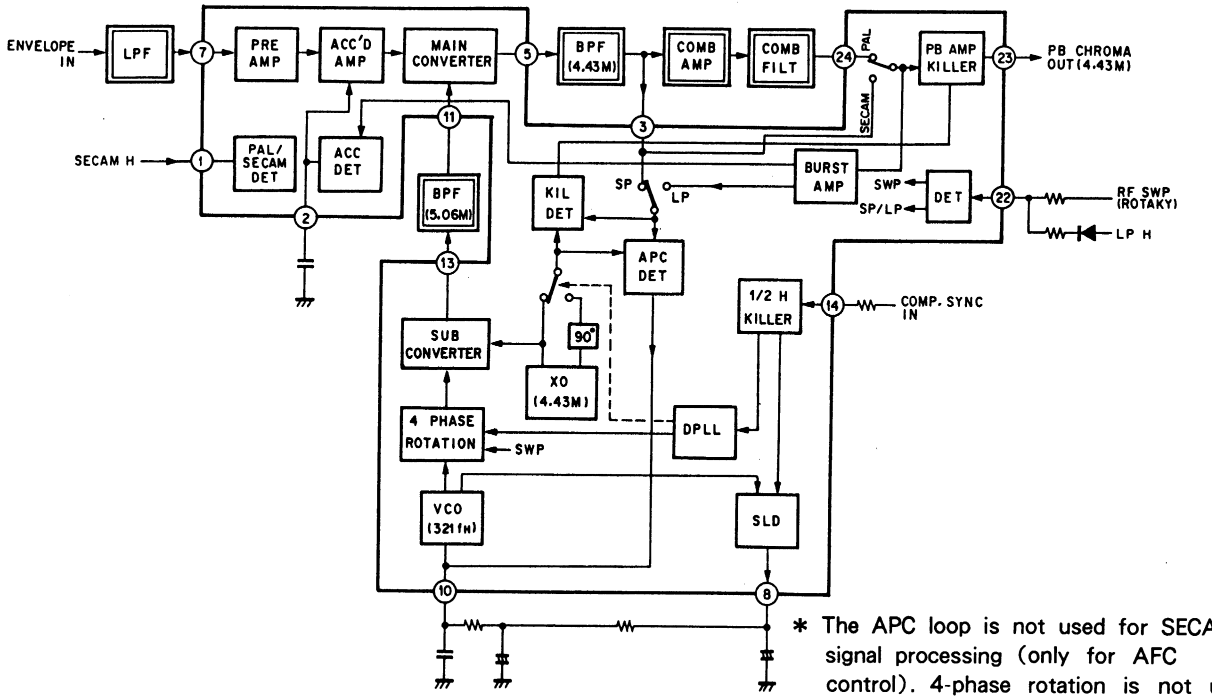

ENVELOPE IN
LPF
PRE AMP
ACC'D AMP
MAIN CONVERTER
BPF (4.43M)
COMB AMP
COMB FILT
PAL
SECAM
PB AMP KILLER
PB CHROMA OUT (4.43M)
SECAM H
PAL/SECAM DET
ACC DET
BPF (5.06M)
KIL DET
SP
LP
BURST AMP
SWP
SP/LP
DET
RF SWP (ROTAKY)
LP H
APC DET
1/2 H KILLER
COMP. SYNC IN
SUB CONVERTER
90°
XO (4.43M)
DPLL
4 PHASE ROTATION
SWP
VCO (321fH)
SLD

Fig. 24

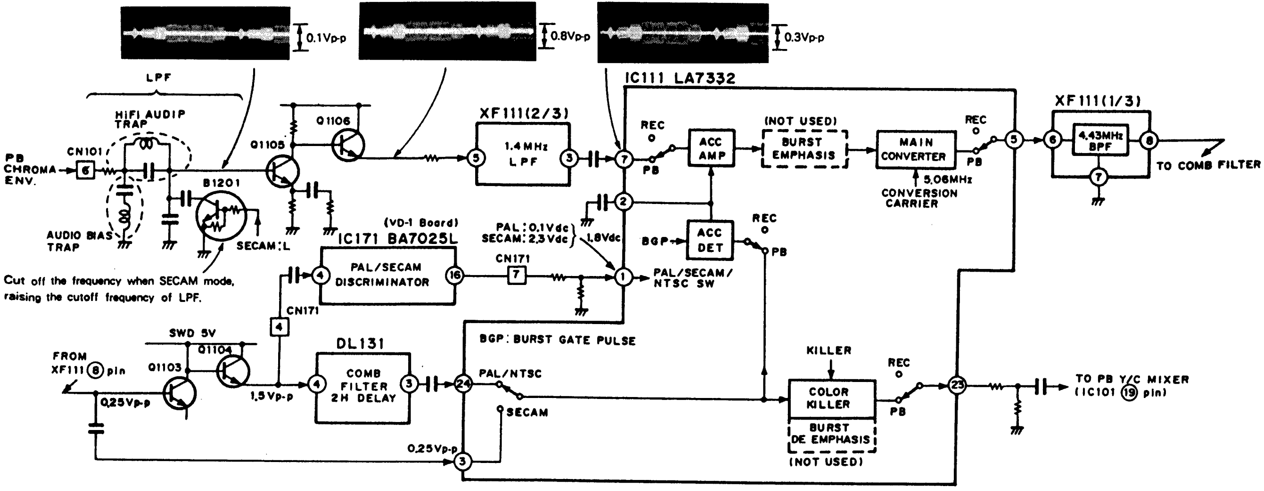
- * The APC loop is not used for SECAM signal processing (only for AFC control). 4-phase rotation is not used either.
- * The SECAM playback signal is output bypassing the comb filter.

Chroma signal flow in the playback mode is as follows.

After being amplified at the preamplifier, the playback signal passes through a somewhat light LPF, then it is amplified by Q1105 and input to the base of the buffer amplifier Q1106. This component has two functions: First, it controls Pin ⑨, which is the color system IC recording/playback mode switching terminal. The playback mode is set when level at Pin ⑨ reaches 2.1V. Second, it inputs the playback low-frequency chroma signal to the 1.4 MHz LPF (Pins ③, ④ and ⑤ of XF111). This LPF extracts only the low-frequency converted chroma signal, which is then input to Pin ⑦. This signal passes through the 6 dB and ACC amplifiers and is input to the main converter. There it is converted to 4.43 MHz and output from Pin ⑤, then its unnecessary frequency components are removed by the 4.43 MHz BPF (Pins ⑥, ⑦ and ⑧ of XF111) and it is input to the comb amplifier. This device compensates for comb filter loss.

Adjacent track crosstalk component is removed from the signal output from the comb filter, then it is input to Pin ㉔, it passes through the killer circuit and is output from Pin ㉓.

After the above processing, the chroma signal is sent to the Y/C mix terminal of IC101, where the luminance signal is processed.


0.1Vp-p
0.8Vp-p
0.3Vp-p
LPF
HIFI AUDIP TRAP
PB CHROMA ENV.
CN101
6
AUDIO BIAS TRAP
B1201
Q1105
Q1106
SECAM:L
XF111(2/3)
1.4MHz LPF
(VD-1 Board)
IC171 BA7025L
PAL/SECAM DISCRIMINATOR
PAL:0.1Vdc
SECAM:2.3Vdc
1.8Vdc
CN171
7
4
SWD 5V
FROM XF111 ⑧ pin
Q1103
Q1104
0.25Vp-p
1.5Vp-p
DL131
COMB FILTER 2H DELAY
BGP: BURST GATE PULSE
PAL/NTSC
SECAM
0.25Vp-p
IC111 LA7332
REC
PB
ACC AMP
(NOT USED)
BURST EMPHASIS
MAIN CONVERTER
5.06MHz CONVERSION CARRIER
BGP
ACC DET
PAL/SECAM/NTSC SW
XF111(1/3)
4.43MHz BPF
TO COMB FILTER
KILLER
COLOR KILLER
BURST DE EMPHASIS
(NOT USED)
TO PB Y/C MIXER (IC101 ⑲ pin)

Cut off the frequency when SECAM mode, raising the cutoff frequency of LPF.

Fig. 25

## 3-3. EXPLANATION OF THE CIRCUIT BLOCKS (see Figs. 22 and 24)

**1. ACC Circuit (automatic color level control)**
During recording, this circuit curbs fluctuation of the 4.43 MHz input carrier chroma signal to keep chroma recording current constant. During playback, it keeps level of the 627 kHz low-frequency chroma signal constant. This circuit prevents the flicker occurred when there is a large difference between channel 1 and channel 2 head outputs.
The ACC circuit of this unit consists of a burst ACC circuit that detects burst signal level both during recording and playback.
The signal from the ACC amplifier is sent to the level detector (ACC DET), where its difference with the reference level is detected and output as a DC potential. The signal is then smoothed by the capacitor attached externally to Pin ② and fed back to the ACC amplifier. Gain of this amplifier depends on the potential at the control terminal. For example, when input signal level is high, gain is reduced to obtain the reference level at the output.

**2. ACK Circuit (automatic color killer circuit)**
When a black-and-white signal is input, the ACC circuit amplifies the noise signal and records it along with the Y-FM signal. The ACK circuit prevents the adverse effect (blurred color output in spite of the black-and-white program) produced when the above signal is played back.
Two methods are used together for a secure killing operation : Peak detection, which detects the color signal input level before applying the killer (killer : on when − 20 dB to the reference input level) and sync detection, which applies the killer after detecting whether the burst signal is present or not.

**3. Main Converter Circuit**
This circuit is used to convert the 4.43 MHz carrier chroma signal to 627 kHz low-frequency and the 627 kHz chroma signal to 4.43 MHz. It is provided with two input terminals. At the output terminal, frequency components resulting of adding and subtracting both inputs are obtained.
During recording, the 4.43 MHz chroma signal from the ACC circuit and the 5.06 MHz signal generated by the APC circuit are input. At the output, signals of 4.43 MHz + 5.06 MHz = 9.49 MHz and 5.06 MHz − 4.43 MHz = 627 kHz are obtained. These signals are passed through a 1.4 MHz LPF to get only the required 627 kHz low-frequency converted chroma signal.
During playback, the 627 kHz and 5.06 MHz signals are input, turning into 4.43 MHz and 5.69 MHz at the output. The carrier chroma signal is obtained by passing this signal through a BPF, thus separating the required 4.43 MHz chroma signal.

## 3-4. CHROMA PROCESSING CONTROL SYSTEM

**1. Principles of Jitter Removal (APC circuit during playback)**
In rotating head video decks, jitter (fluctuation on the time axis) is produced in the playback signal due to factors such as drum rotation irregularity, tape stretching and shrinking, speed changes in the tape transport system, etc. Jitter results in color subcarrier instability (fsc : 4.43 MHz) and the subsequent changes in phase. This produces changes in playback picture hue and saturation, definitely deteriorating picture quality. The APC circuit is used to prevent this.

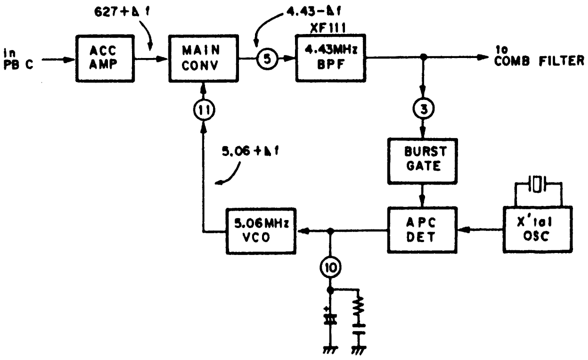


Fig. 26

The low-frequency converted playback chroma signal from the ACC circuit is input to one terminal of the main converter, and the carrier signal converted to 5.06 MHz to the other, thus recovering the original 4.43 MHz chroma signal.
The main flow of this signal goes into the comb filter. The separated branch is input to Pin ③, then it passes through the burst gate and is input to the phase comparator (APC DET). This comparator is also supplied with a 4.43 MHz accurately generated by the crystal oscillator. These two signals are phase-compared. If the playback signal is advanced phase, the error output potential is lowered ; if it is delayed, the error output potential is turned up.
This potential is smoothed at a filter (accessed through Pin ⑩) composed of a resistor and a capacitor, then it is input to the control terminal of the 5.06 MHz VCO (voltage-controlled oscillator) to control its oscillation frequency.
The above-mentioned jitter appears as a difference from the reference frequency (4.43 MHz), i.e. a phase deviation, when the signal is converted back to its original frequency. Let's suppose a + Δ f jitter is contained in the 627 kHz chroma signal. The other input of the main converter is a single-frequency 5.06 MHz signal, so its output shall be :

$5.06 - (0.627 + \Delta f) = 4.43 - \Delta f$ (MHz)

APC DET error output potential goes up by just the $-\Delta f$ delayed phase amount, as well as the VCO oscillation frequency.

Frequency of the converted carrier signal input to the main converter becomes $5.06 + \Delta f$ MHz, and the output becomes

$5.06 + \Delta f - (0.627 + \Delta f) = 4.43$ (MHz)

The circuit works in the same way for removing $-\Delta f$ jitter. This process is called an APC loop.

**Note 1 :** On the 5.06 MHz VCO

In the general block diagram it is seen as composed by the VCO itself (5.015 MHz), 4-phase rotation and sub conv., but in the explanation it is referred to as just 5.06 VCO and one block for the sake of simplicity.

**Note 2 :** Principle of operation of the APC DET (phase comparator)

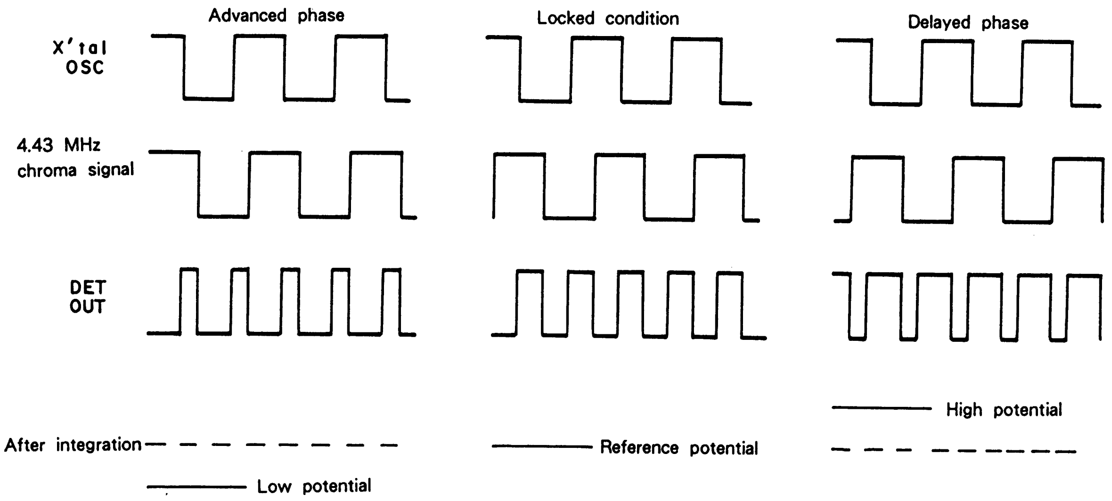

Advanced phase
Locked condition
Delayed phase
X'tal OSC
4.43 MHz chroma signal
DET OUT
After integration
Low potential
Reference potential
High potential

Fig. 27

[APC loops for each mode]

A quicker response and a better PM noise reduction can be obtained by diverting the burst signal for input to APC DET before the 2H comb filter. In the LP mode, however, the APC loop would be adversely affected by the large crosstalk, lowering the S/N ratio. Therefore, the burst signal is diverted after the comb filter in this case.

The APC loop is set as shown below for each tape speed and video standard.

| System<br>Tape Speed | PAL | ME SECAM |
|---|---|---|
| SP | Before the comb filter (Pin ③ input) | The APC loop is not used. |
| LP | After the comb filter (Pin ㉔ input) | |

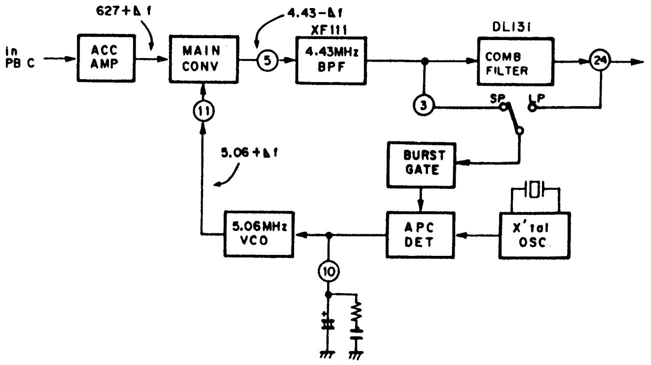

In PB C
ACC AMP
627+Δf
MAIN CONV
4.43−Δf
XF111
4.43MHz BPF
DL131
COMB FILTER
SP
LP
BURST GATE
APC DET
X'tal OSC
5.06MHz VCO
5.06+Δf
⑤
③
㉔
⑪
⑩

Fig. 28

## 2. PS (Phase Shift) Color System

### (1) Crosstalk Removal Using a Comb Filter

There are no guard bands between video tracks recorded on tape. Therefore, crosstalk from adjacent tracks during playback is a problem to be considered. Crosstalk in the frequency-modulated luminance signal is dealt with by the azimuth effect, but in the low-frequency converted chroma signal the azimuth effect alone is not enough to remove crosstalk. To solve this, the PS color system was developed. This system takes advantage of the line correlativity of video signals (the fact that adjacent signals are practically equal).

Fig. 29 shows the phase of tracks recorded on a tape. When comparing channel 1 and channel 2, we see that channel 2 is recorded by rotating the phase 90° at 1H intervals. This is why this system is called PS (phase shift) color system.

Let's have a look first at channel 1 playback. In Fig. 29, solid-line arrows indicate the channel 1 signal, and small dotted-line arrows show crosstalk components from channel 2. Now observe that signal sectors located 2H from each other have solid-line arrows pointing in the same direction and dotted-line arrows pointing in opposite directions. Thus, crosstalk components can be removed by adding the 2H delayed signal to the original one using a comb filter.

Next, let's examine channel 2 playback. Since phase of channel 2 is shifted 90° during recording, the signal must be restored to its original phase. If phase is advanced 90° at 1H intervals, the main signal gets in phase with the signal sector located 2H away from it (and the respective crosstalk components get opposite phases) like in channel 1, allowing for crosstalk removal by means of a comb filter.

[MESECAM mode]

The PS color recording system, in which the channel-2 signal is phase-shifted, is not used for SECAM chrominance signal processing. Therefore, the signal is diverted to the output (Pin ③) before the comb filter (2H delay) during SECAM playback.

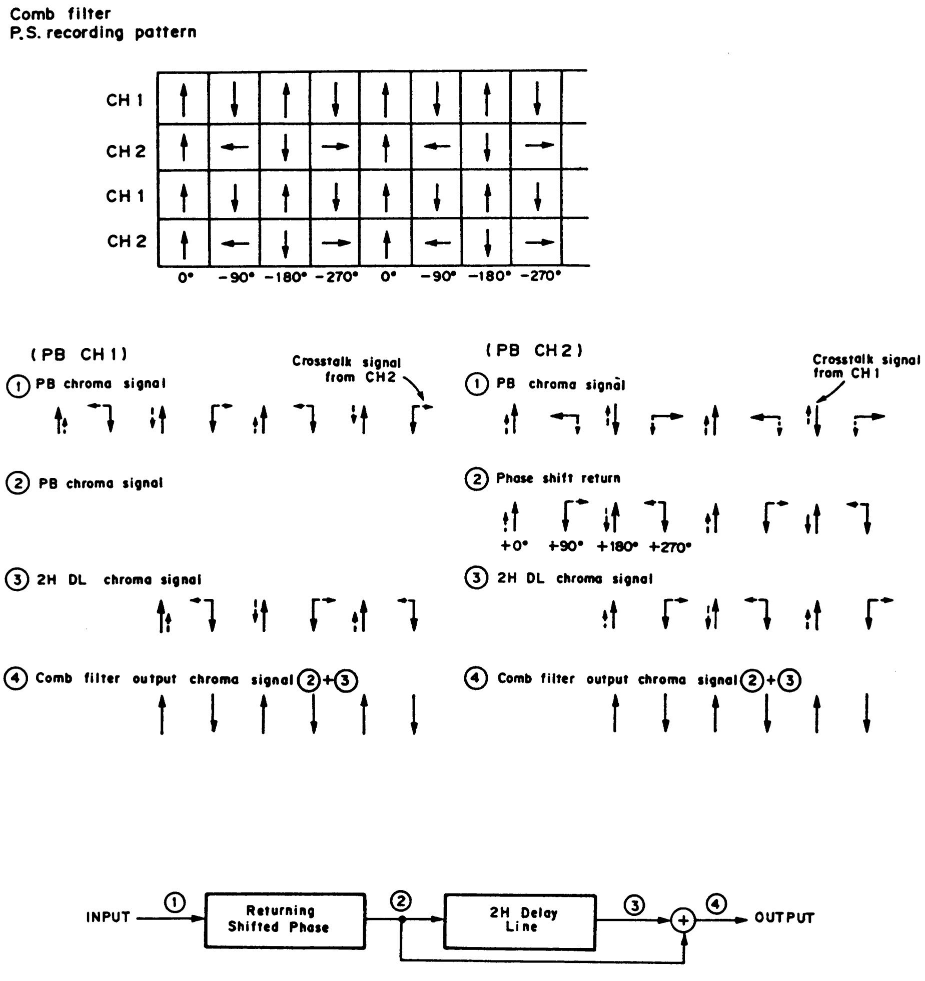

Comb filter
P.S. recording pattern
CH 1
CH 2
CH 1
CH 2
0° -90° -180° -270° 0° -90° -180° -270°
(PB CH 1)
① PB chroma signal
Crosstalk signal from CH2
② PB chroma signal
③ 2H DL chroma signal
④ Comb filter output chroma signal ②+③
(PB CH 2)
① PB chroma signal
Crosstalk signal from CH 1
② Phase shift return
+0° +90° +180° +270°
③ 2H DL chroma signal
④ Comb filter output chroma signal ②+③
INPUT
①
Returning Shifted Phase
②
2H Delay Line
③
④
OUTPUT

Fig. 29

(2) Phase Shift Circuit

To make crosstalk removal with a comb filter possible, phase of the chroma signal has to be securely shifted every 90 ° . The frequency conversion carrier signal input to the main converter for shifting purposes is phase-shifted. To do this, a certain phase relation between this carrier signal (5.06 MHz) and the input chroma signal (4.43 MHz or 627 kHz) has to be maintained. This is achieved using the APC, AFC and 4-phase shift circuits.

① APC Circuit

This circuit matches phase of the carrier signal input to the sub converter to that of the chroma signal burst component. The ACC amplifier output passes through the burst gate, and only the burst component is input to the phase comparator (APC DET). This comparator is also supplied with the signal from the VXO (variable crystal oscillator), so the phases of both signals are compared and their error difference is output to Pin ⑮. This output is then smoothed by the filter of Pin ⑮, and VXO oscillation frequency is controlled so that phase matches with that of the burst signal.

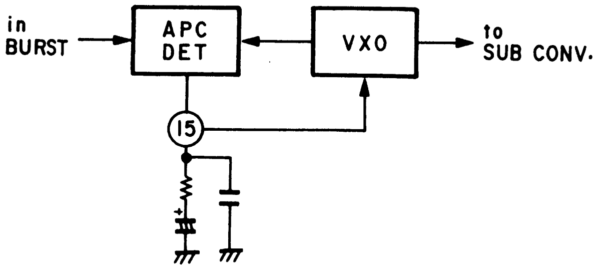


Fig. 30

② AFC Circuit

This circuit consists of a VCO PLL (Phase-Locked Loop) that locks the VCO oscillation frequency to a frequency equal to 321 times that of the recorded signal horizontal sync component.

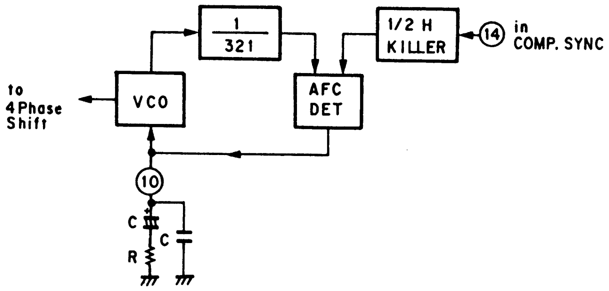


Fig. 31

H pulse (ⓑ) with its equalization period removed by passing the composite sync signal (ⓐ) through a 1/2H killer circuit is generated. Duty of this signal is 50%.

On the other hand, VCO output is divided by 321, and simultaneously the gate pulse (ⓒ) for phase comparison is generated. The detection output (ⓓ) is obtained by phase-comparing ⓑ and ⓒ at the AFC DET. This detection output is smoothed by the filter at Pin ⑩ and used to control VCO oscillation frequency.

The above process is called AFC loop or VCO PLL.

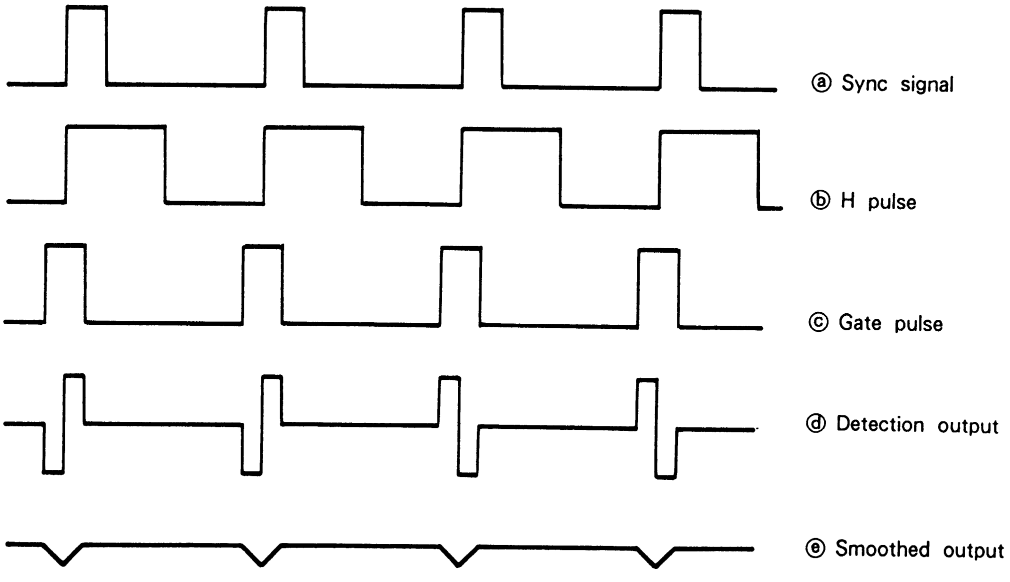


Fig. 32

③ 4-phase Shift Circuit

This circuit produces a signal whose phase is shifted 90° at 1H intervals, to be input to the remaining sub converter terminal.

[MESECAM mode]

Since the PS recording system is not used for SECAM chrominance signal processing, the 4-phase shift circuit is fixed to 0° .

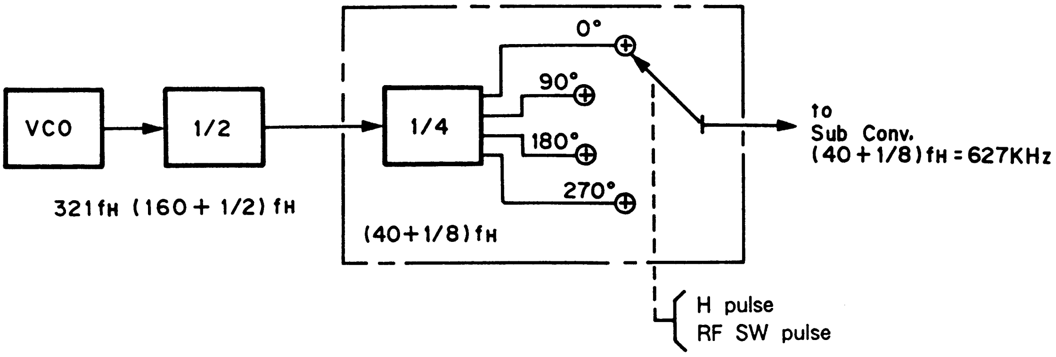

VCO
1/2
321fH (160+1/2) fH
1/4
(40+1/8) fH
0°
90°
180°
270°
to
Sub Conv.
(40+1/8) fH=627KHz
H pulse
RF SW pulse

Fig. 33

The 4-phase shift circuit is composed of a 1/2 divider and a 1/4 divider. Four signals, 90° out-of-phase respect to each other, are obtained by 1/4 division. They are switched at 1H intervals by the H pulse generated at the AFC circuit and sent to the sub converter.

In the PAL system, phase shift is applied only to channel 2 (RF SW pulse at high level). A 90° phase delay is introduced at 1H intervals during recording, and a 90° phase advance during playback.

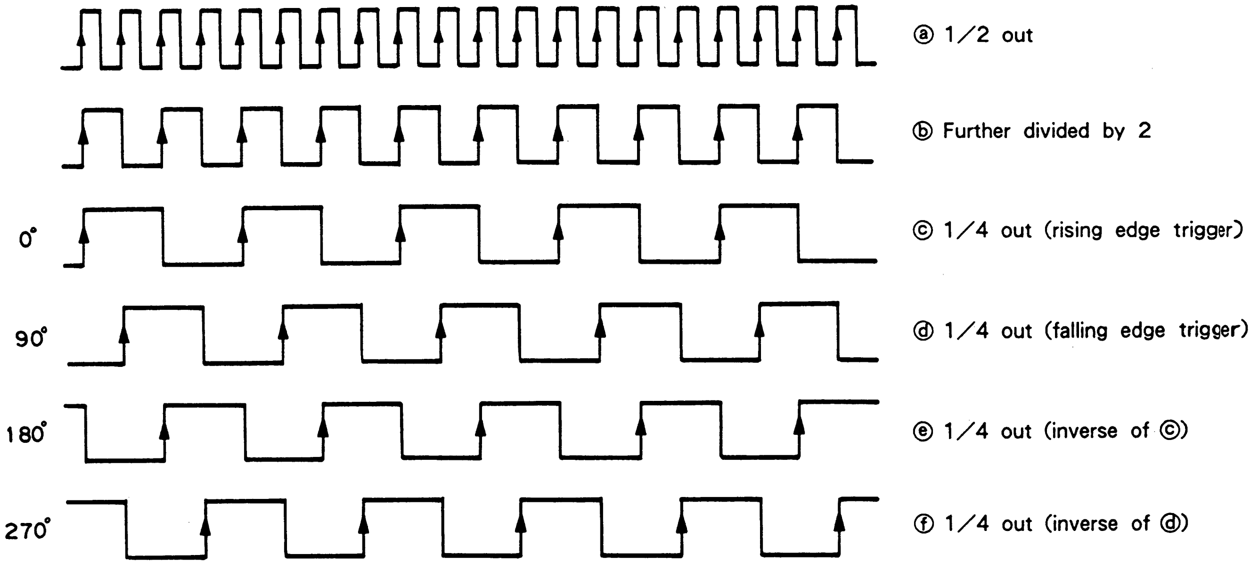

ⓐ 1/2 out
ⓑ Further divided by 2
0°
ⓒ 1/4 out (rising edge trigger)
90°
ⓓ 1/4 out (falling edge trigger)
180°
ⓔ 1/4 out (inverse of ⓒ)
270°
ⓕ 1/4 out (inverse of ⓓ)

Fig. 34

**3. Frequency Interleave**

At the AFC circuit, VCO oscillation frequency is controlled so that it becomes 321 times that of the horizontal sync signal. Then it is divided by 8 at the 4-phase shift circuit, becoming 40 + 1/8 times. This produces frequency interleave with the luminance signal, reducing wavering.

According to the sampling theorem, the luminance signal is spectrally distributed to an integral multiple of the horizontal sync signal frequency (15.625 kHz). Even when this luminance signal is frequency-modulated for recording, it is spectrally distributed to an integral multiple of 15.625 kHz. When recording on tape, the chroma signal converted to a low frequency is superposed to the frequency-modulated luminance signal. At this time, wavering due to interference between the luminance and chroma signals can be reduced by aiming at the valleys in the luminance signal frequency distribution pattern.

Since 4-phase shift is applied, the chroma signal is represented by four spectrums. These spectrums are distributed to (40 + n/8 : n = an odd number) times the horizontal sync signal.

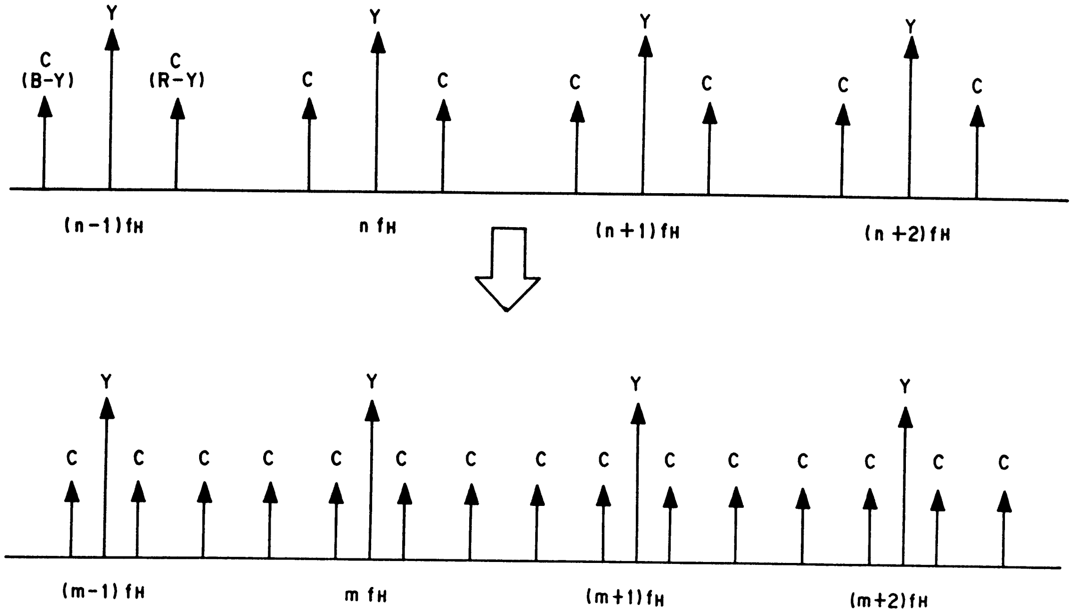


Fig. 35

**4. Side Lock Prevention Circuit**

At the start of picture playback or when adjacent tracks are skipped during special playback, etc., APC fails and the VCO oscillation frequency is deviated from the specification. When this deviation reaches a certain frequency, the APC loop is locked. This is called side lock or mislock.

During playback, the APC loop phase-compares the crystal oscillator output signal with the playback burst signal and feeds back the error voltage to the VCO to keep the oscillation frequency at 5.015 MHz. When side lock occurs, VCO oscillation frequency is deviated from 5.015 MHz, so frequency (and hence phase) of the frequency conversion carrier signal (5.06 MHz) input to the main converter is affected as well, resulting in unacceptable hue changes.

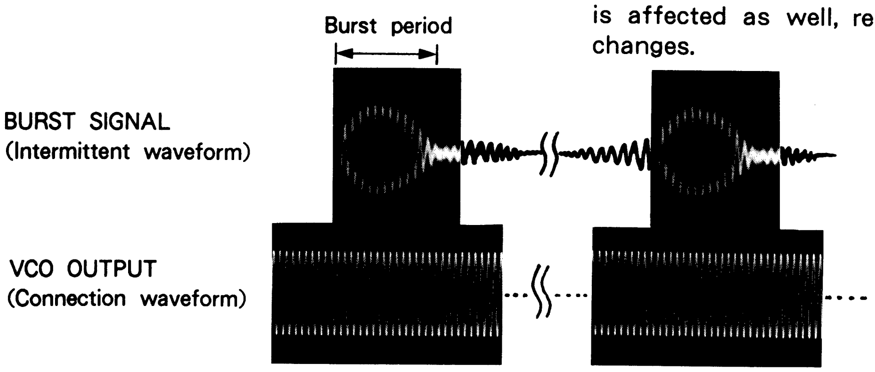


Fig. 36

Follows a simplified explanation of the side lock effect.
The APC circuit only works on the two input signals shown in the figure during burst periods. Therefore, it does not respond to frequency changes occurred while the burst gate is closed; it assumes the burst signal is continuous. In case there is a difference of exactly n cycles (n = an integer) between a burst and the next one, i.e. burst signal frequency is shifted an integral number of times from the horizontal sync signal, the APC loop appears to be locked if the signal is only observed during the burst period.

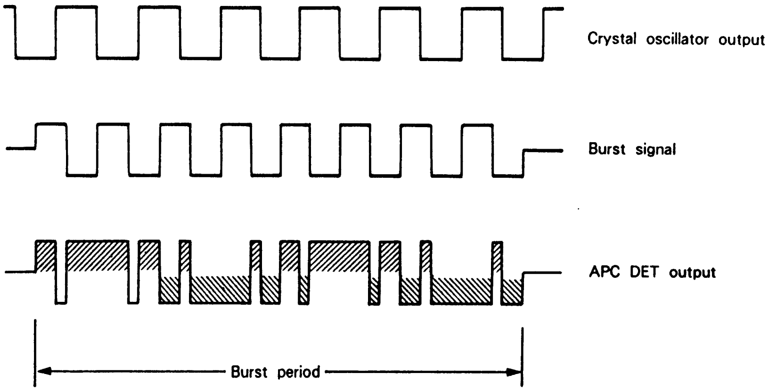


**Fig. 37**

As shown in Fig. 3-15, the burst signal and the crystal oscillator output are not in phase, but since high and low level periods of the APC DET output are equal the same potential of a normal lock condition is obtained by integrating while passing the signal through a filter, and VCO cannot be controlled.
The side lock condition is detected as follows.
This condition is detected by counting the APC circuit VCO oscillation frequency. This frequency is divided by 8 before being input to the sub converter. Therefore, the APC loop will be side-locked, resulting in hue distortion, even if the above oscillation frequency is shifted 8 × n times (n = an integer) the horizontal sync signal frequency (15.625 kHz).

The side lock detection circuit counts VCO cycles over a 4H period. When the number of cycles goes beyond a specified value (± 4), a compensation pulse is produced. This pulse is filtered by the capacitor (C1105) at Pin ⑧. When this capacitor is charged by the compensation pulse, the pulse is sent to the VCO control terminal through R1102. This is called the APC ID pulse.

* Values for a 4H Period in the Normal Lock Condition
Gate period : $(1/15625) \times 4 = 0.256$ ms
VCO frequency : $321 \times 15625 = 5015.625$ kHz
Counts : $5015.625 \times 0.256 = 1284$

* Values for a 4H Period in the Mislock Condition (n = 1)
VCO frequency : $321 \times 15625 + 8 \times 15625$
$= 5140.625$ kHz
Counts : $5140.625 \times 0.256 = 1316$

## 3-5. IC MODE SWITCHING TERMINALS

**1. REC/PB mode switching terminal (Pin ⑨)**
Pin ⑨ is the recording chroma signal output terminal, but it is also used for recording/playback mode switching control.
Namely, the playback mode is set when a voltage of 2.1 V DC or above is applied to Pin ⑨, and the recording mode when no voltage is externally applied to it.

As shown in Fig. 38, PB 5V power is used to apply DC voltage through the Q1106 transistor for playback only, and the playback chroma signal is simultaneously input to Pin ⑦ via the LPF (XF111). During recording, since the PB 5V voltage is not applied to Pin ⑨, the chroma signal passes through the LPF (XF111), then it is sent to the recording amplifier. (The XF111 LPF is used for both recording and playback.)

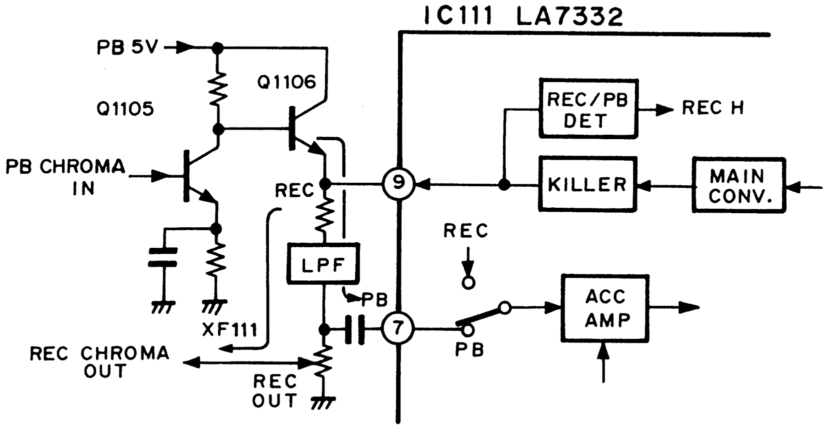

IC111 LA7332
PB 5V
Q1105
Q1106
PB CHROMA IN
REC
9
LPF
PB
7
XF111
REC CHROMA OUT
REC OUT
REC/PB DET
REC H
KILLER
MAIN CONV.
REC
PB
ACC AMP

Fig. 38

**2. SP/LP mode switching (Pin ㉒)**
Pin ㉒ is where the RF SW pulse is input to differentiate channels 1 and 2 during 4-phase shift (PS) in the PAL system, but it is also used for LP/SP speed switching control.
As shown in Fig. 39, two comparators are connected to Pin ㉒, allowing to recognize two control conditions as shown in Fig. 40.
SP/LP internal control is used for APC loop switching during playback.

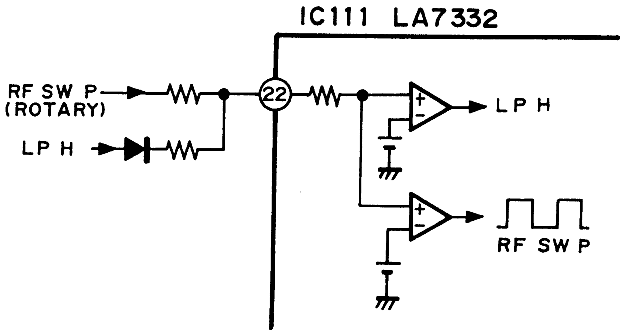

IC111 LA7332
RF SW P (ROTARY)
LP H
22
LP H
RF SW P

Fig. 39

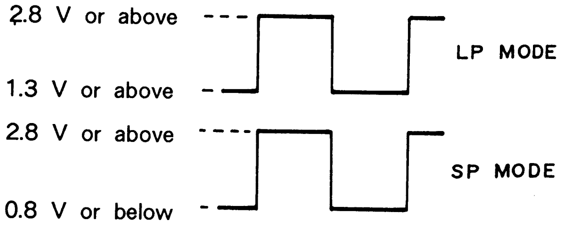


Fig. 40. Waveform at Pin ㉒

### 3. PAL/NTSC/MESECAM switching terminal (Pin ①)

IC111 (LA7332) can be switched among three settings for NTSC chroma signal processing, PAL chroma signal processing, and SECAM signal processing according to the MESECAM system.

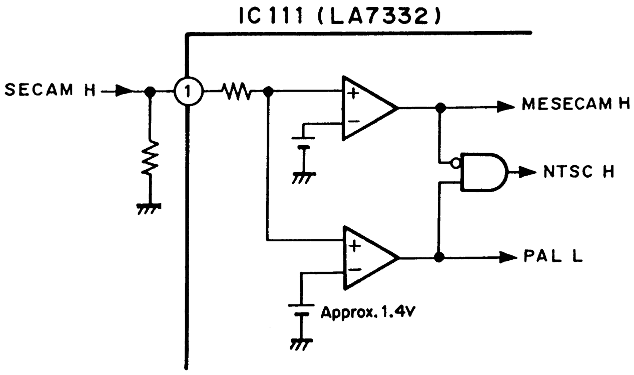


Fig. 41

As shown in Fig. 41, IC111 is composed of two comparators and a gate. The relation between the voltage applied to Pin ① and the IC internal mode is shown below (Tables 1 and 2).

| Voltage applied to Pin ① | Mode |
|---|---|
| 0 to 1.0V | PAL |
| 1.7 to 3.2V | NTSC |
| 3.9 to 5.0v | MESECAM |

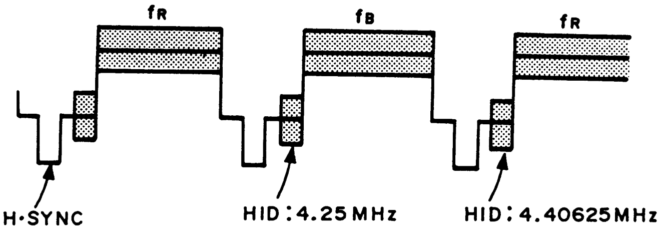
Table 1

| MODE | | NTSC | PAL | MESECAM |
|---|---|---|---|---|
| NO FREQUENCY | | $320f_H$ | $321f_H$ | $321f_H$ |
| VCO CONTROL | REC | AFC | AFC | AFC |
| | PB | APC | APC | |
| VXO CONTROL | REC | APC | APC | free run |
| | PB | free run | free run | |
| PB APC LOOP | SP | after COMB | before COMB | — |
| | LP | after COMB | after COMB | |
| | EP | | — | |
| APC KILLER ID | | ○ | ○ | OFF |
| 4 PHASE SIFT (ROTATION) | 1CH (LOW) | 90° advance every 1H | STOP | STOP |
| | 2CH (HIGH) | 90° delay every 1H | 90° delay every 1H | |
| 4 PHASE SIFT CLOCK | REC | H.SYNC | H.SYNC | — |
| | PB | DPLL | DPLL | |
| | ⑮pin : H | H.SYNC | H.SYNC | |
| BURST EMPHASIS DE-EMPHASIS | SP | ○ | — | — |
| | LP | — | | |
| | EP | ○ | | |
| SLD MASK (INHIBIT) | ⑮pin : H<br>ACC KILLER | Not masked | Not masked | — |
| | Others | Masked for a 19H period from the SW pulse edge. | | |

Table 2

## 3-6. SECAM CHROMA SIGNAL PROCESSING

**1. Characteristics of the SECAM chroma signal**
In this chroma signal, two kinds of FM subcarrier (obtained by modulating the R − Y and B − Y color-difference signals respectively), are alternately superposed to the luminance signal at intervals of one horizontal scanning period.

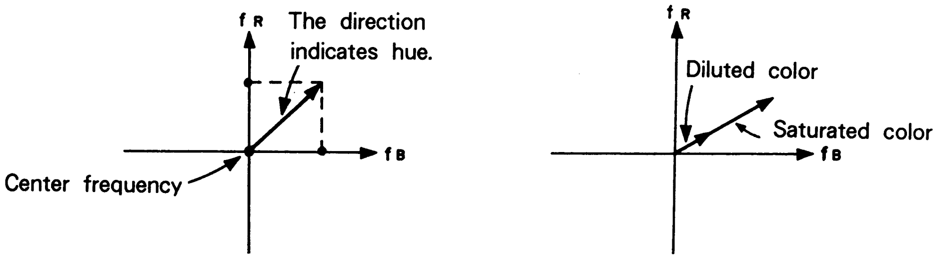

fR
fB
fR
H·SYNC
HID:4.25MHz
HID:4.40625MHz

fB : Signal obtained by frequency modulation of the B − Y signal
fR : Signal obtained by frequency modulation of the R − Y signal

Fig. 42

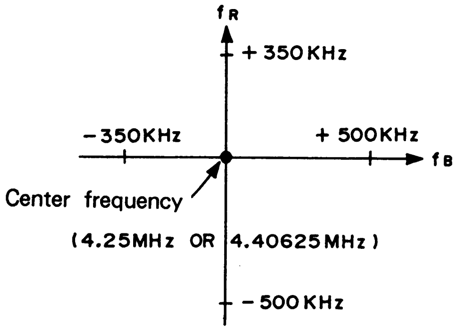
A signal called HID is included instead of the burst signal used in the PAL system. R − Y and B − Y lines are differentiated by detecting the HID frequency.
The SECAM chroma signal is totally different from NTSC and PAL signals.

In these later systems, chroma signal level indicates color saturation, while hue is given by the phase difference between the burst and chroma signals. In the SECAM system, the direction of the vector composed from fR and fB indicates hue, and frequency deviation gives colour saturation (see the figures below).


fR
The direction indicates hue.
fB
Center frequency
fR
Diluted color
Saturated color
fB

Hue

Color saturation


fR
+350KHz
−350KHz
+500KHz
fB
Center frequency
(4.25MHz OR 4.40625MHz)
−500KHz

Frequency deviation limit

Fig. 43

**2. chroma signal processing method**

The PAL chroma signal, obtained by amplitude modulation of a single-frequency signal, allows for crosstalk removal by 90° phase shift (PS) as explained in the previous section. The SECAM chroma signal, however, is composed of two FM signals, preventing the use of phase shifting for crosstalk removal.

The MESECAM system has been developed to permit processing of the SECAM FM chroma signal with the same circuits used for the PAL signal.

In this case, the 90° phase shift circuit is fixed to 0° , and the APC circuit (which detects and controls the phase during playback is not used. The main internal blocks of IC111 (LA7332) during MESECAM processing are shown in Fig. 44.

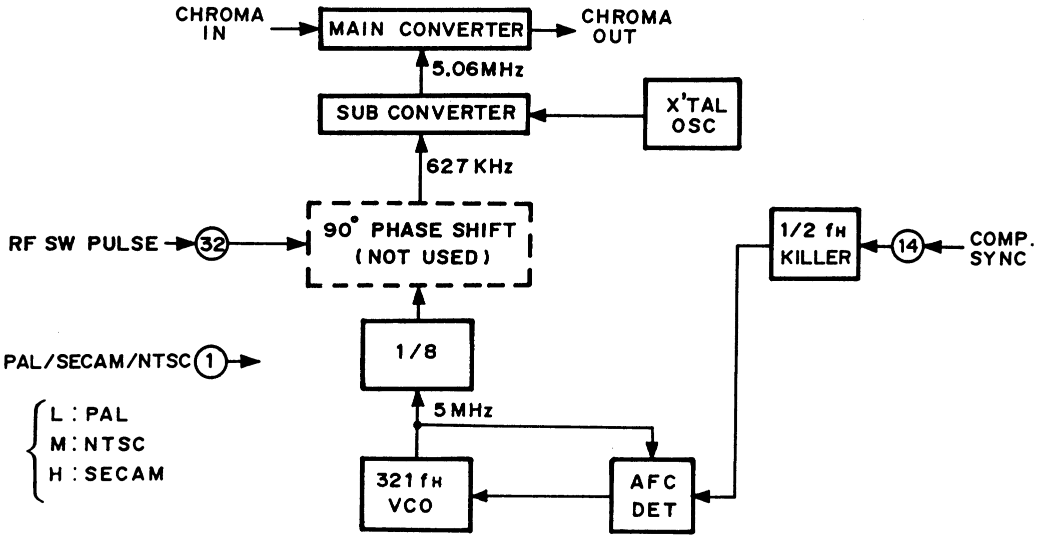

CHROMA IN
MAIN CONVERTER
CHROMA OUT
5.06MHz
SUB CONVERTER
X'TAL OSC
627KHz
RF SW PULSE
32
90° PHASE SHIFT (NOT USED)
1/2 fH KILLER
14
COMP. SYNC
PAL/SECAM/NTSC
1
L : PAL
M : NTSC
H : SECAM
1/8
5MHz
321 fH VCO
AFC DET

Fig. 44

| ME SECAM | | |
|---|---|---|
| VCO FREQUENCY | REC/PB | 321fH |
| VCO CONTROL | REC/PB | AFC |
| X'TAL CONTROL | REC/PB | FREE RUN |
| 90° PHASE SHIFT (PS) | REC/PB | NOT USED (Fixed to 0°.) |

## 3-7. PAL/SECAM Discrimination Circuit (VD-1 Board)

In PAL/SECAM compatible units, each system switching is required for the chroma signal processing IC (IC111, LA7332). A PAL/SECAM discrimination circuit is provided on the VD-1 board to automatically generate a system switching signal (PAL H/MESECAM H).

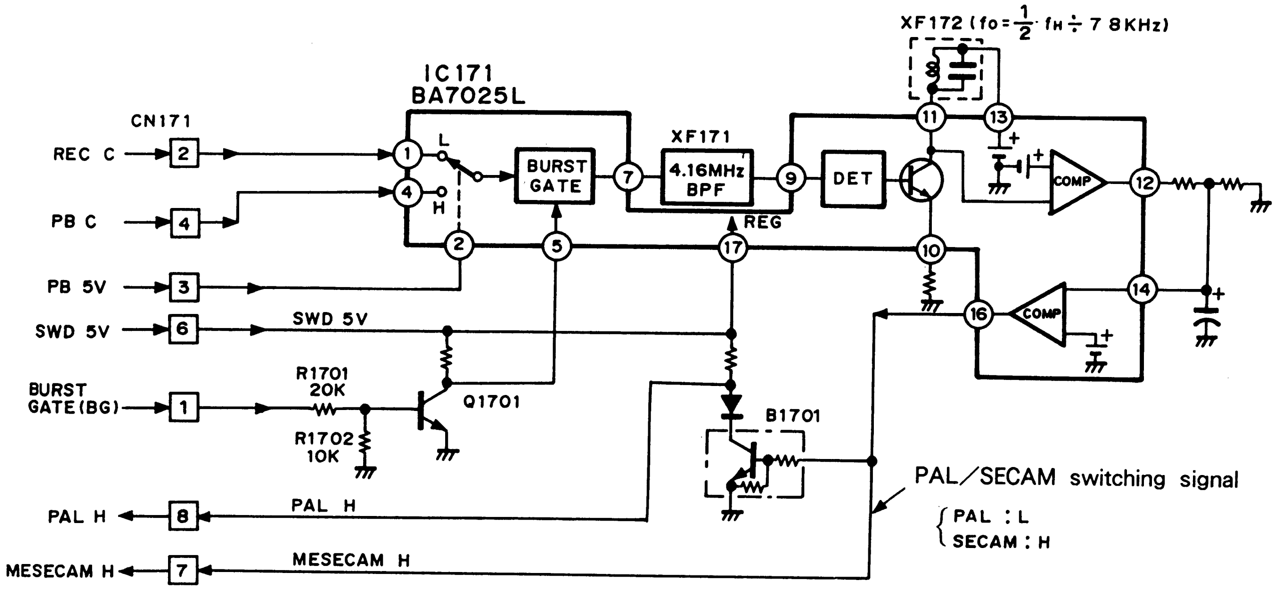

XF172 (fo=$\frac{1}{2}$·fH ÷ 7 8KHz)
IC171
BA7025L
CN171
REC C
PB C
PB 5V
SWD 5V
BURST GATE(BG)
PAL H
MESECAM H
2
4
3
6
1
8
7
L
H
BURST GATE
XF171
4.16MHz BPF
DET
REG
COMP
COMP
1
4
2
5
7
9
17
11
13
10
12
14
16
SWD 5V
R1701
20K
R1702
10K
Q1701
B1701
PAL H
MESECAM H
PAL/SECAM switching signal
PAL : L
SECAM : H

Fig. 45

[Operation of Q1701]
Pin ⑭ of the chroma signal processing IC (IC111, LA7332) works both as a composite sync signal input terminal and as a burst gate pulse output terminal.

Voltage at Pin ⑭ is 1.2 V when receiving the composite sync signal, and 4.2 V when the burst gate pulse is output. A detector circuit composed of R1701, R1702 and Q1701 is provided on the VD-1 board to select the burst gate pulse.

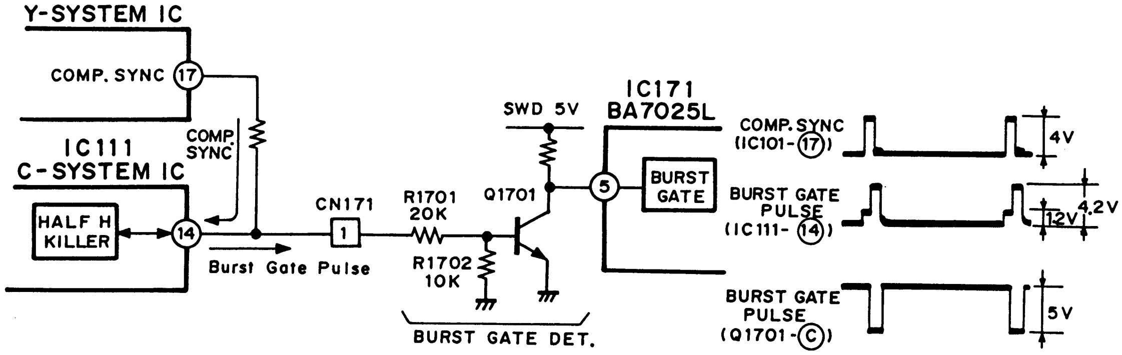

IC101
Y-SYSTEM IC
COMP. SYNC
17
COMP. SYNC
IC111
C-SYSTEM IC
HALF H KILLER
14
Burst Gate Pulse
CN171
1
R1701
20K
R1702
10K
Q1701
SWD 5V
BURST GATE DET.
IC171
BA7025L
5
BURST GATE
COMP. SYNC (IC101-⑰)
4V
BURST GATE PULSE (IC111-⑭)
4.2V
1.2V
BURST GATE PULSE (Q1701-Ⓒ)
5V

Fig. 46

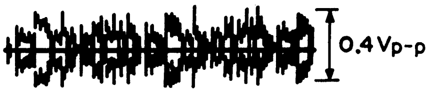
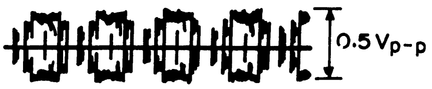
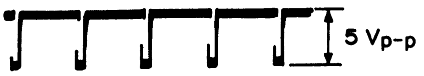
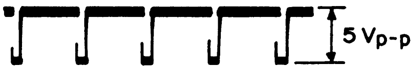
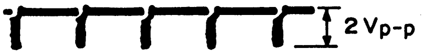
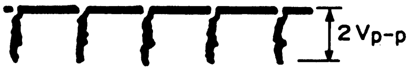
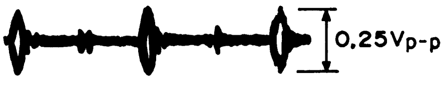
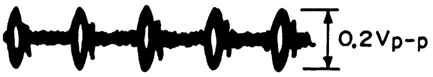
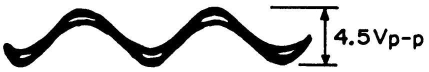
| | SECAM | PAL |
|---|---|---|
| REC CHROMA ①pin |  |  |
| BURST GATE PULSE ⑤pin |  |  |
| GATED BURST ⑦pin |  |  |
| TUNNED BURST ⑨pin |  |  |
| 1/2fH TUNED ⑪pin |  | |
| ⑫pin | 4.2Vdc | 0Vdc |
| ⑭pin | 4.2Vdc | 0Vdc |
| OUTPUT ⑯pin | 4.4Vdc | 0.1Vdc |

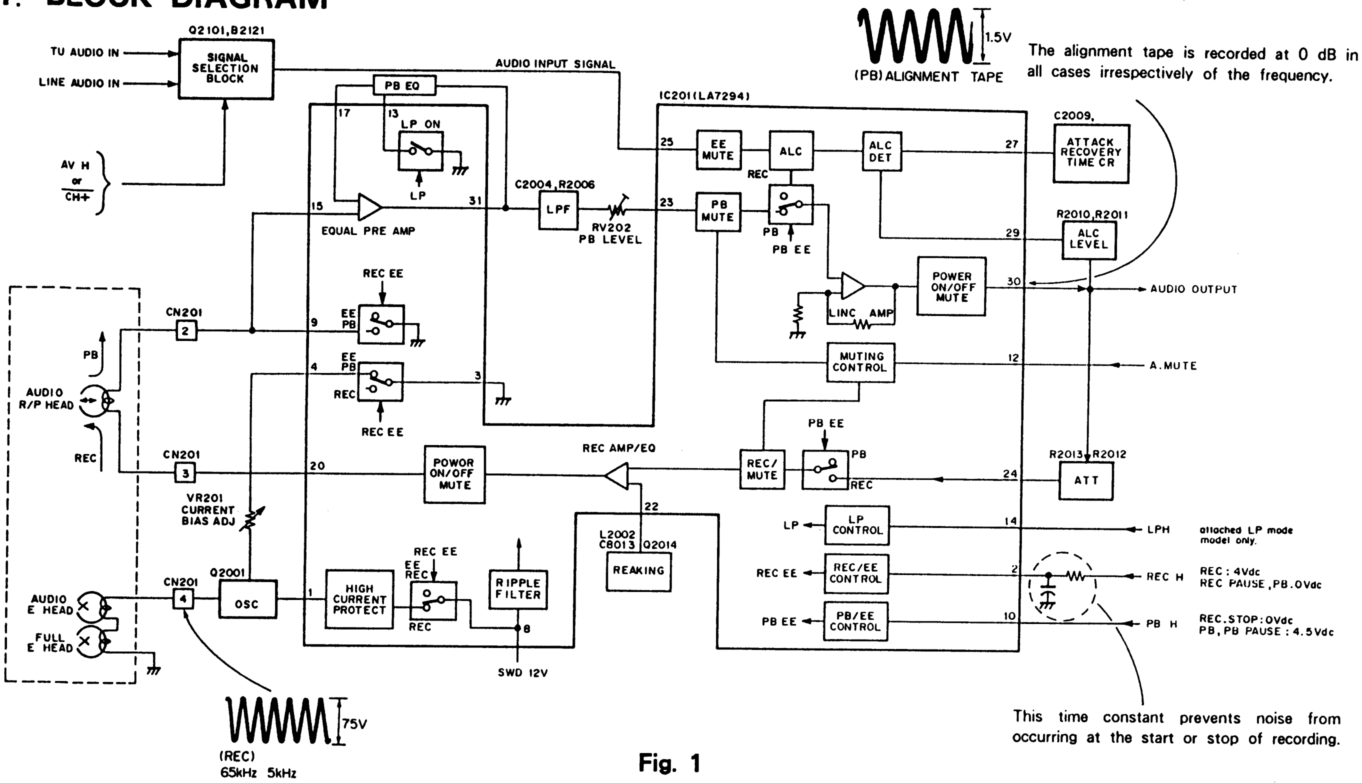
**Fig. 47**

Frequency of the PAL burst signal is always 4.43 MHz, but the SECAM HID signal changes between 4.25 MHz and 4.4025 MHz at 1H intervals.
IC171 differentiates between the PAL and SECAM signals by determining whether the 4.25 MHz signal is present or not.
The burst (PAL) or HID (SECAM) signal is extracted from the chroma signal input to Pin ① or ④ by the burst gate pulse input to Pin ⑤.

The extracted signal passes through a 4.16 MHz BPF and is detected. If it is a SECAM signal, an output signal as shown in Fig. 47 is obtained by means of the tuning circuit connected to Pin ⑪. This signal is then compared to the reference voltage at the comparator, and Pin ⑯ outputs a high level.

# 5. AUDIO CIRCUIT

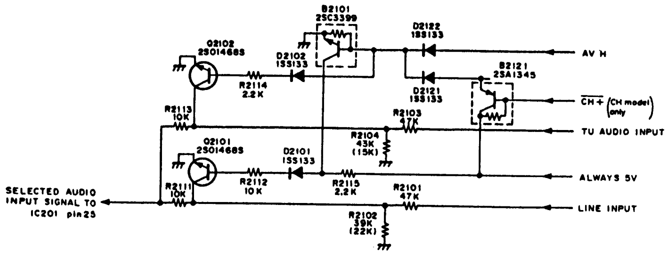
## 1. BLOCK DIAGRAM


Q2101,B2121
TU AUDIO IN
LINE AUDIO IN
SIGNAL SELECTION BLOCK
AV H or CH+
AUDIO INPUT SIGNAL
PB EQ
17
13
LP ON
LP
15
31
EQUAL PRE AMP
C2004,R2006
LPF
RV202 PB LEVEL
IC201(LA7294)
25
23
EE MUTE
ALC
REC
PB MUTE
PB
PB EE
ALC DET
27
29
C2009,
ATTACK RECOVERY TIME CR
R2010,R2011
ALC LEVEL
1.5V
(PB) ALIGNMENT TAPE
POWER ON/OFF MUTE
30
AUDIO OUTPUT
LINC AMP
MUTING CONTROL
12
A.MUTE
REC EE
EE
PB
9
4
3
CN201
2
3
4
PB
AUDIO R/P HEAD
REC
AUDIO E HEAD
FULL E HEAD
VR201 CURRENT BIAS ADJ
Q2001
OSC
20
1
POWOR ON/OFF MUTE
REC AMP/EQ
22
L2002 C8013
Q2014
REAKING
HIGH CURRENT PROTECT
RIPPLE FILTER
8
SWD 12V
REC/ MUTE
PB EE
R2013
R2012
24
ATT
LP CONTROL
14
LPH
attached LP mode model only.
REC/EE CONTROL
REC EE
2
REC H
REC : 4Vdc
REC PAUSE ,PB.0Vdc
PB/EE CONTROL
PB EE
10
PB H
REC.STOP:0Vdc
PB,PB PAUSE : 4.5Vdc
75V
(REC)
65kHz 5kHz

The alignment tape is recorded at 0 dB in all cases irrespectively of the frequency.

This time constant prevents noise from occurring at the start or stop of recording.

Fig. 1


B2101
2SC3399
D2122
1SS133
Q2102
2SD1468S
D2102
1SS133
AV H
B2121
2SA1345
R2114
2.2K
D2121
1SS133
CH+ (CH model only)
R2113
10K
R2103
47K
TU AUDIO INPUT
Q2101
2SD1468S
D2101
1SS133
R2104
43K
(15K)
ALWAYS 5V
SELECTED AUDIO INPUT SIGNAL TO IC201 pin25
R2111
10K
R2112
10K
R2115
2.2K
R2101
47K
LINE INPUT
R2102
39K
(22K)

INPUT SELECT CIRCUIT

Fig. 2

### [REC Mode]

A signal from the tuner and that from the line are selected by the input switching circuit and fed to Pin 25 of IC201. The signals fed to Pin 25 are passed through the REC/PB switch and the line amplifier and then output to Pin 30. One of these signal becomes an EE output, and the other is fed to Pin 24 as a REC signal, passed through the REC amplifier, and then output to Pin 20. Now, the audio bias signal is added, and supplied from Pin 3 of CN201 to the audio head.

### [Input Switching]

When the audio switching signal AV H is 5V input or $\overline{\text{CH+}}$ is 0V input, B2101 is turned ON, and Q2101 is turned OFF.

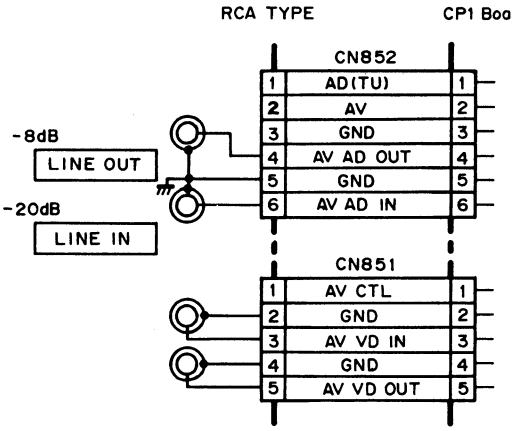
As a result, the line audio signal is fed to Pin 25 of IC201. Also, Q2102 is turned ON by the switching signal passed through D2102, and the audio signal of the tuner is grounded. On the other hand, when the audio switching signal AV H is 0V or $\overline{\text{CH+}}$ is 5V, just the reverse of what has been described is made, and the audio signal of the tuner is fed to Pin 25 of IC1201.

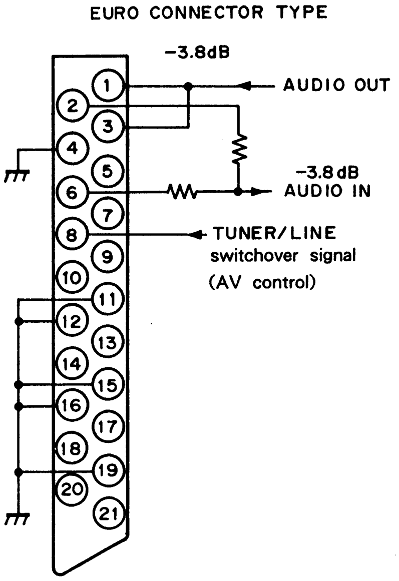
### [PB Mode]

The signal picked up by the audio head is fed to Pin 15, and the frequency characteristic is adjusted by the equalizing amplifier for output to Pin 21. This signal is level controlled by VR202 and fed to Pin 23. It is then passed trough the line amplifier and output to Pin 30 as a playback signal.

## 2. INPUT CIRCUIT

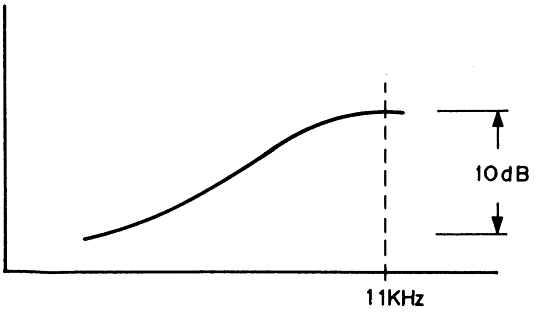
The input circuit is available in two types, namely, the RCA type (pin jack) and the 21-pin Euro connector, depending upon the shipping destination. Following is respective I/O level.


RCA TYPE
CP1 Board
CN852
1 AD(TU) 1
2 AV 2
3 GND 3
4 AV AD OUT 4
5 GND 5
6 AV AD IN 6
-8dB
LINE OUT
-20dB
LINE IN
CN851
1 AV CTL 1
2 GND 2
3 AV VD IN 3
4 GND 4
5 AV VD OUT 5

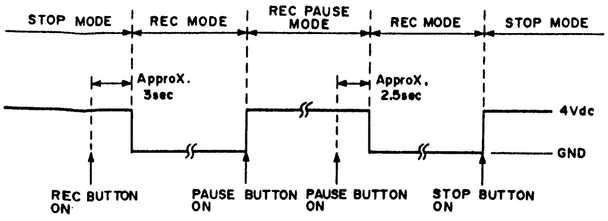

EURO CONNECTOR TYPE
-3.8dB
AUDIO OUT
-3.8dB
AUDIO IN
TUNER/LINE
switchover signal
(AV control)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

## 3. REC SYSTEM

**[REC EQ]**
This unit operates only in the SP mode. No characteristic switchover is made for that reason. (Pin 26 and Pin 28 are not used.)
The frequency near 11 kHz is emphasized at approx. 10 dB.



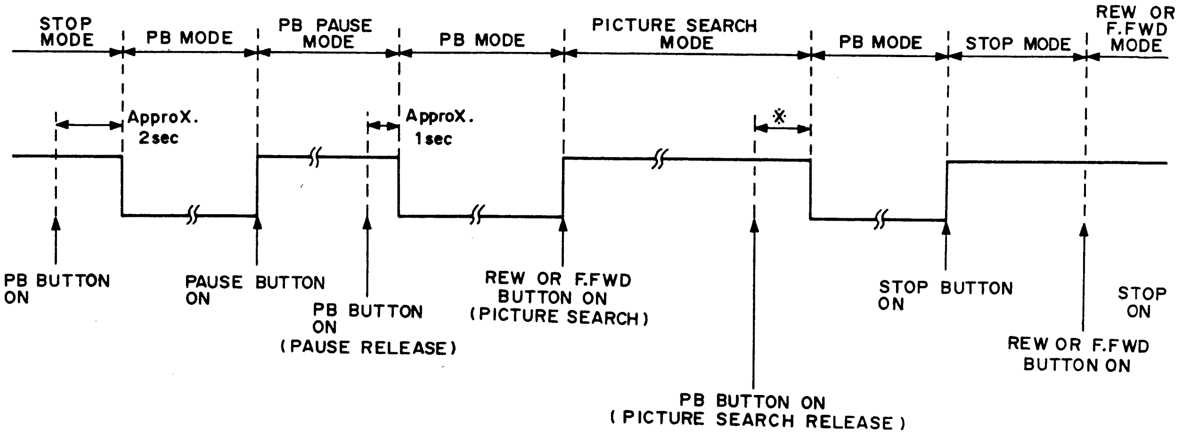
**[REC Mute]**
The control is made by the audio mute signal at Pin 12 input.


STOP MODE
REC MODE
REC PAUSE MODE
REC MODE
STOP MODE
ApproX. 3sec
ApproX. 2.5sec
4Vdc
GND
REC BUTTON ON
PAUSE BUTTON ON
PAUSE BUTTON ON
STOP BUTTON ON

## 4. PLAYBACK SYSTEM

**[PB EQ]**
The characteristic switchover can be made according to the tape speed (SP or LP), but Pin 13 is not used in this unit since it operates only in the SP mode.

**[PB Mute]**
The control is made by the audio mute signal at Pin 12 input.


STOP MODE
PB MODE
PB PAUSE MODE
PB MODE
PICTURE SEARCH MODE
PB MODE
STOP MODE
REW OR F.FWD MODE
ApproX. 2sec
ApproX. 1sec
※
PB BUTTON ON
PAUSE BUTTON ON
PB BUTTON ON (PAUSE RELEASE)
REW OR F.FWD BUTTON ON (PICTURE SEARCH)
PB BUTTON ON (PICTURE SEARCH RELEASE)
STOP BUTTON ON
REW OR F.FWD BUTTON ON
STOP ON

※ FWD SEARCH —— PB: ApproX.1sec
RVS SEARCH —— PB: ApproX.2sec

## 5. AUDIO IC TERMINAL FUNCTIONS

IC201 (LA7294) Terminal Description

| Pin No. | Description of Function |
|---|---|
| 1 | Outputs the power for bias oscillator circuit during recording. |
| 2 | REC control terminal. H : REC, L : PB/PB PAUSE |
| 3 | GND |
| 4 | Connected to GND during EE/PB. |
| 5 | Ripple filter terminal connected with the power supply. |
| 6 | Ripple filter terminal connected with the capacitor for filter. |
| 7 | Changes the resonance frequency with the head by connecting the LP switch and capacitor. Not used because this unit operates only in the SP mode. |
| 8 | Power supply. |
| 9 | Head switch connected to GND during REC. |
| 10 | PB control terminal. H : PB/PB PAUSE, L : REC |
| 11 | Changes the resonance frequency with the head by connecting the EP switch and capacitor. Not used because this unit operates only in the SP mode. |
| 12 | For mute control during REC/PB. Muting is done at above 3.3 Vdc. |
| 13 | LP/EP switch. This terminal reduces the amount of feedback of the PB EQ AMP and increases the gain of a high band frequency. Not used because this unit operates only in the SP mode. |
| 14 | For EP control. It causes the internal switches to be turned ON at Pins 11, 13, and 28 at above 3 Vdc. Not used because this unit operates only in the SP mode. |
| 15 | Inputs a playback signal from the head. |
| 16 | GND |
| 17 | Applies negative feedback from the EQ AMP output (Pin 21) to provide EQ characteristics. |
| 18 | For LP control. It causes the internal switches to be turned ON at Pin 7, 13, and 26.<br>Not used because this unit operates only in the SP mode. |
| 19 | GND |
| 20 | REC AMP output. |
| 21 | EQ AMP output. |
| 22 | Performs peaking of high-band frequency needed for characteristics by connecting capacitor and |
| 23 | resistor between the GND.<br>PB signal input. |
| 24 | REC signal input. |
| 25 | Line AMP input. |
| 26 | LP switch. It changes the high-band peaking frequency during LP REC. |
| 27 | Connects a CR filter between the ALC filter and the GND. |
| 28 | EP switch. It changes the high-band peaking frequency during EP REC. |
| 29 | ALC detector input. It inputs a line AMP output signal to Pin 30. |
| 30 | Line AMP output. |

**Table 1**

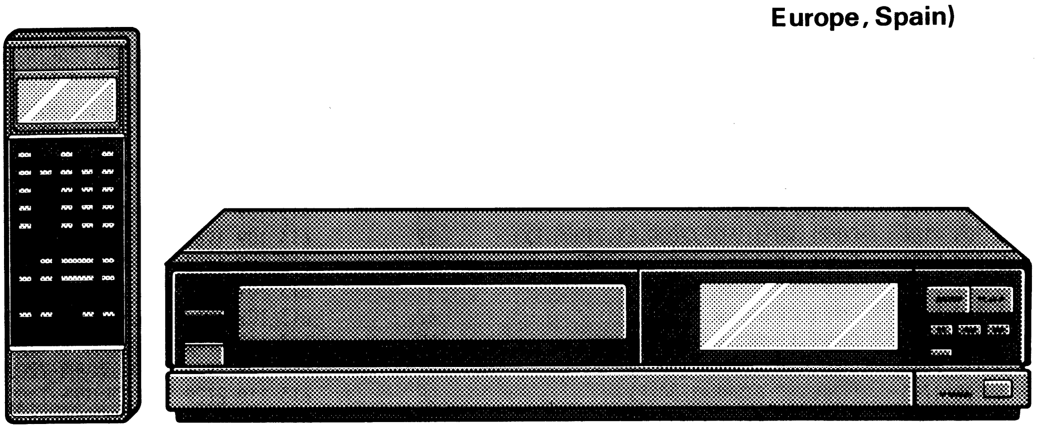
SANYO

# Parts List & Circuit Diagrams

## Video Cassette Recorder

## VHR-7200G, 7100G
## VHR-7200EX, 7100EX
## VHR-8200SP, 8100SP
## VHR-8250SP

**(West Germany, Switzerland, Europe, Spain)**



(VHR-7200G)

VHS PAL HQ

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COMPL, RM-1 ............... 17
Circuit Diagram

Please see other materials with Reference No. given in table below.

| Materials | Model No. | Reference No. |
|---|---|---|
| Service Manual | VHR-7200<br>7100. 8200<br>8100 Series | WM-530606 |
| Mechanism Manual | P90<br>Mechanism | WM-530599 |

### PRODUCT SAFETY NOTICE

The components designated by a symbol (⚠) in this schematic diagram designates components whose value are of special significance to product safety. Should any component designated by a symbol need to be replaced, use only the part designated in the Parts List. Do not deviate from the resistance, wattage and voltage ratings shown.

NOTE: 1. Parts order must contain Model Number, Part Number and Description.
2. N.S.P.: Not available as service parts.

| | |
|---|---|
| RP1/G, G-2C1F, EX, EX-2 | 143 125 00, 128 00, 125 04, 14 |
| RP1/SP, SP-2, RP1L/SP | 143 125 06, 07, 27 |

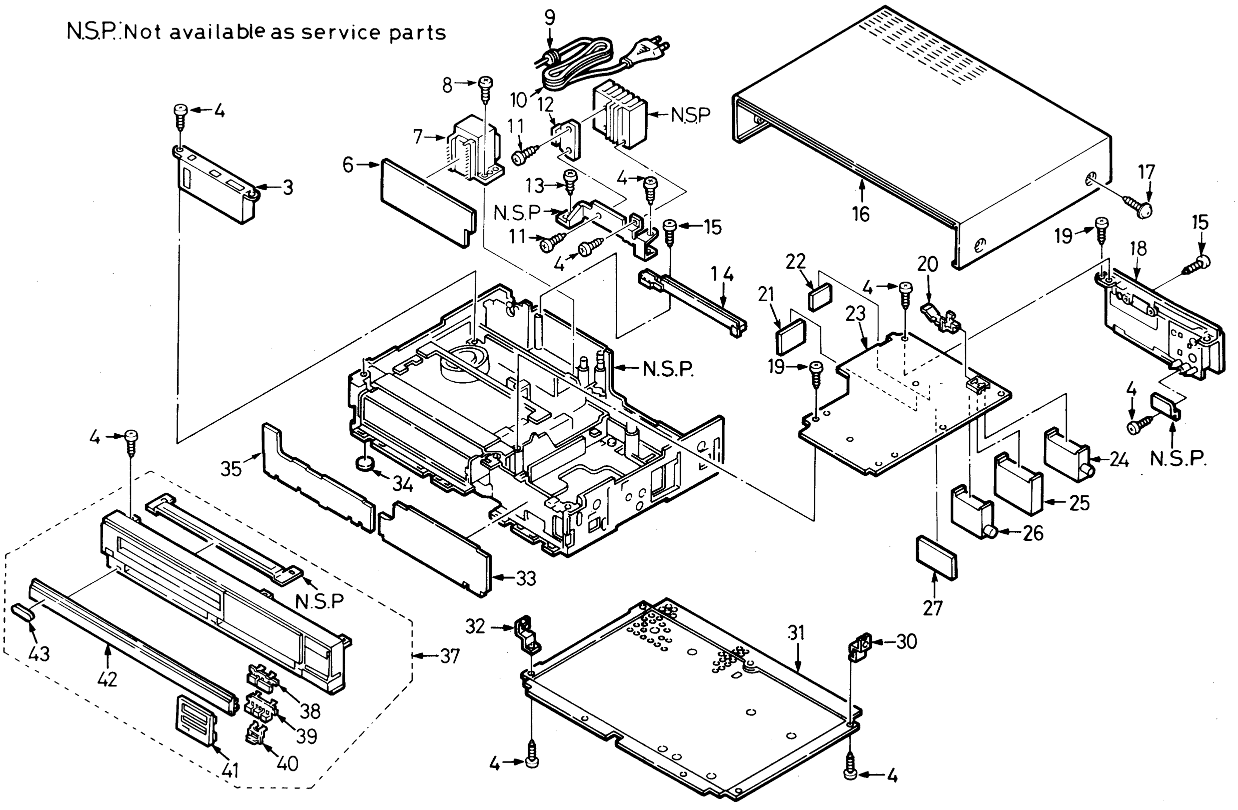
**REFERENCE No. WM-530607**

## CABINET & CHASSIS PARTS

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| 3 | 613 108 8764 | COMPL,VP-1(VHR-7200G,7100G) |
| OR | 613 108 8757 | COMPL,VP-1(EXCEPT VHR-7200G,7100G) |
| 4 | 411 137 0007 | SCR L-TPG BIN 3X10 |
| 6 | 613 108 8771 | COMPL,PW-1(VHR-7200G,7100G) |
| OR | 613 108 4209 | COMPL,PW-1(EXCEPT VHR-7200G,7100G) |
| 7 ⚠ | 613 108 4094 | TRANS,POWER,T5001 |
| OR ⚠ | 613 108 5428 | TRANS,POWER,T5001 |
| 8 | 411 021 9604 | SCR S-TPG BIN 4X8 |
| 9 ⚠ | 613 053 6686 | FIXER |
| 10 ⚠ | 613 086 0507 | CORD,POWER |
| OR ⚠ | 613 086 2150 | CORD,POWER |
| 11 | 411 021 4500 | SCR S-TPG BIN 3X16 |
| 12 | 613 108 4216 | COMPL,PW-2 |
| 13 | 411 021 5705 | SCR S-TPG BIN 3X6 |
| 14 | 613 077 3487 | BLIND |
| 15 | 411 021 3701 | SCR S-TPG BIN 3X10 |
| 16 | 613 109 3782 | COVER,TOP |
| 17 | 412 024 7604 | SPECIAL SCREW |
| 18 | 613 110 0152 | TERMINAL(INCLUDE CP-A) |
| 19 | 411 021 3800 | SCR S-TPG BIN 3X10 |
| 20 | 613 059 4198 | SPRING PLATE |
| 21 | 613 108 4186 | COMPL,VD-1(VHR-7200G,EX,7100G,EX) |
| 22 | 613 108 5534 | COMPL,TM-8(VHR-7200G,7100G) |
| 23 | 613 109 0682 | COMPL,CP-A(VHR-7200G) |
| OR | 613 110 5706 | COMPL,CP-A(VHR-7100G) |
| OR | 613 109 0699 | COMPL,CP-A(VHR-7200EX) |
| OR | 613 110 2040 | COMPL,CP-A(VHR-7100EX) |
| OR | 613 109 1795 | COMPL,CP-A(VHR-8200SP) |
| OR | 613 109 1801 | COMPL,CP-A(VHR-8100SP) |
| OR | 613 113 4485 | COMPL,CP-A(VHR-8250SP) |
| 24 | 613 080 5836 | MODULATOR,RF |
| OR | 613 093 2990 | MODULATOR,RF |

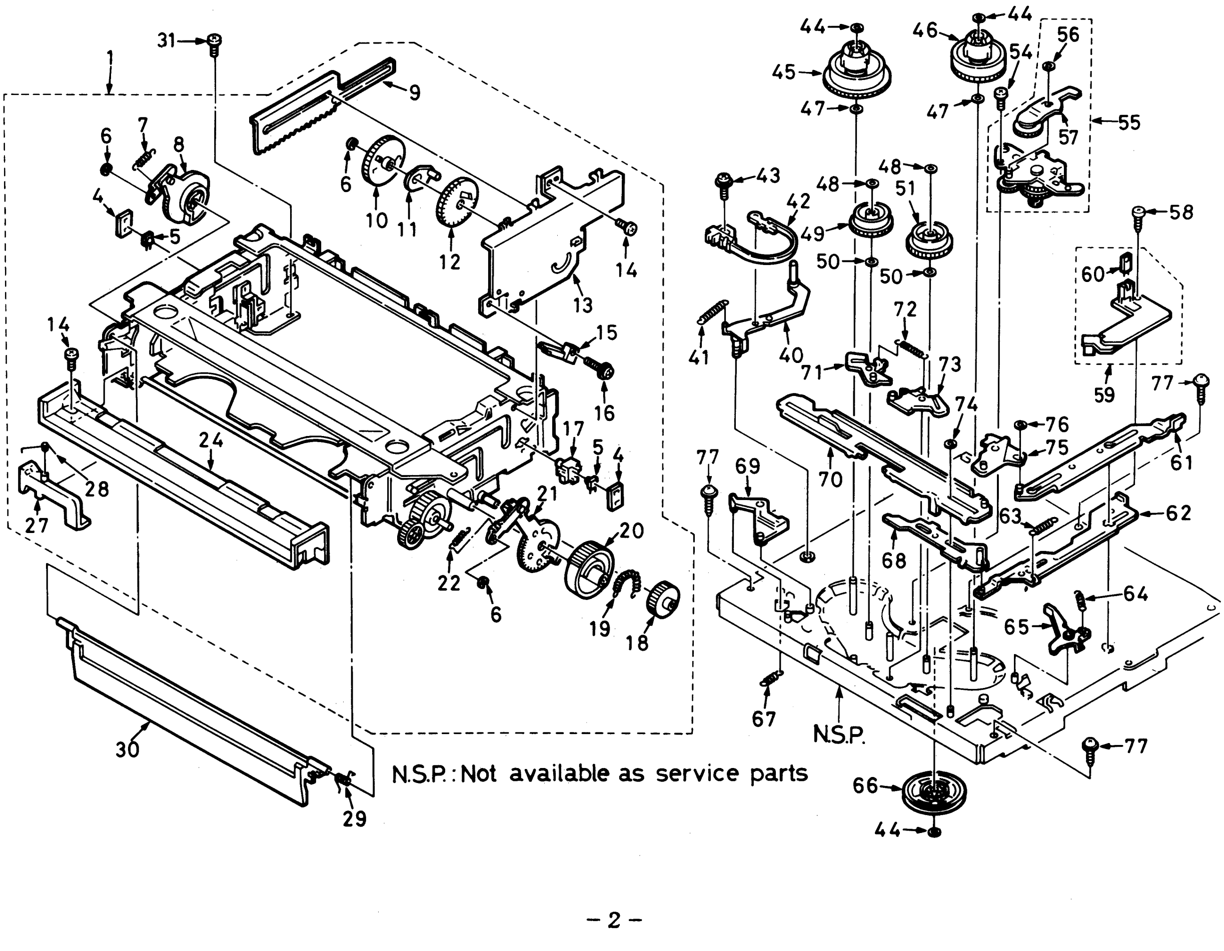
| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| 25 | 613 107 0547 | IF PACK(VHR-7200G,EX,7100G,EX) |
| OR | 613 094 4436 | IF PACK(VHR-8200SP,8100SP,8250SP) |
| 26 | 613 113 7974 | TUNER PACK(VHR-7200G,EX,7100G,EX) |
| OR | 613 094 4429 | TUNER PACK(VHR-8200SP,8100SP, 8250SP) |
| 27 | 613 109 1030 | COMPL,TN-7 |
| 30 | 613 048 6912 | BRACKET |
| 31 | 613 022 0578 | COVER,BOTTOM |
| 32 | 613 022 0738 | BRACKET,CABINET |
| 33 | 613 108 9730 | COMPL,TM-1(EXCEPT VHR-8250SP) |
| OR | 613 111 5446 | COMPL,TM-1(VHR-8250SP) |
| 34 | 613 047 1772 | STAND |
| 35 | 613 108 9761 | COMPL,TM-2 |
| 37 | 613 108 7743 | COMPL,CABINET,FRONT(VHR-7200G) |
| OR | 613 110 3252 | COMPL,CABINET,FRONT(VHR-7100G) |
| OR | 613 109 2266 | COMPL,CABINET,FRONT(VHR-7200EX) |
| OR | 613 110 3269 | COMPL,CABINET,FRONT(VHR-7100EX) |
| OR | 613 109 3621 | COMPL,CABINET,FRONT(VHR-8200SP) |
| OR | 613 109 3638 | COMPL,CABINET,FRONT(VHR-8100SP) |
| OR | 613 111 6658 | COMPL,CABINET,FRONT(VHR-8250SP) |
| 38 | 613 109 1979 | HINGE BUTTON,STOP PLAY |
| 39 | 613 109 1986 | HINGE BUTTON,PAUSE REW FF |
| 40 | 613 109 1993 | HINGE BUTTON,REC |
| 41 | 613 109 1948 | ESCUTCHEON |
| 42 | 613 109 1917 | DOOR(VHR-7200G) |
| OR | 613 110 2712 | DOOR(VHR-7100G) |
| OR | 613 109 1924 | DOOR(VHR-7200EX) |
| OR | 613 110 2729 | DOOR(VHR-7100EX) |
| OR | 613 109 3409 | DOOR(VHR-8200SP) |
| OR | 613 109 3416 | DOOR(VHR-8100SP) |
| OR | 613 111 6054 | DOOR(VHR-8250SP) |
| 43 | 613 042 0183 | BADGE |

N.S.P.:Not available as service parts



## MECHANISM PARTS 1

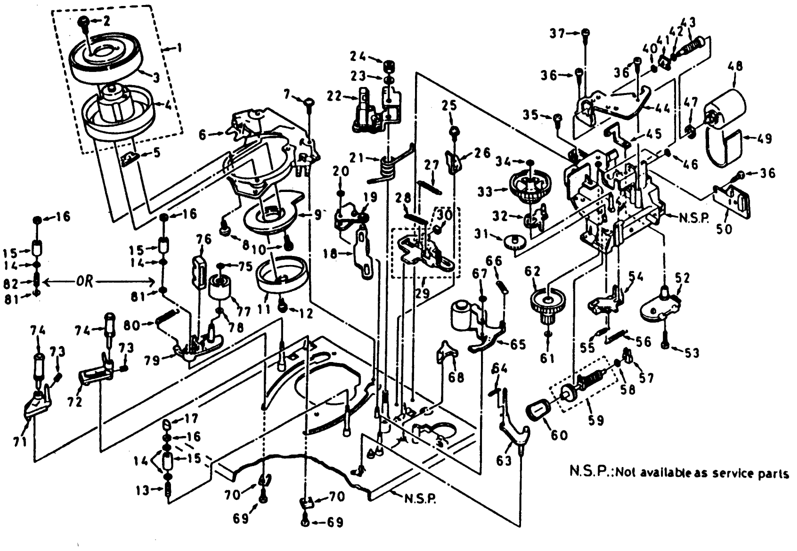
| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| 1 | 613 087 4412 | COMPL,CASSETTE MECHA |
| 4 | 613 022 0585 | LID |
| 5 | 407 098 3201 | PHOTO COUPLE PN150SAN |
| 6 | 411 015 9801 | RING E 2.3 |
| 7 | 613 022 1643 | SPRING,LINK L |
| 8 | 613 022 0073 | ASSY,GEAR,LEVER L |
| 9 | 613 022 2695 | RACK |
| 10 | 613 022 2633 | GEAR,LOCK |
| 11 | 613 021 9916 | ASSY,LEVER,PINION |
| 12 | 613 022 2626 | GEAR,PINION |
| 13 | 613 021 9657 | ASSY,BRACKET,GEAR |
| 14 | 411 027 1305 | SCR S-TPG BIN 2.6X4 |
| 15 | 613 006 4479 | SPECIAL SWITCH |
| OR | 613 095 0949 | SPECIAL SWITCH |
| 16 | 411 106 9208 | SCR PAN+SW+W 2X9 |
| 17 | 613 022 0936 | HOLDER,TRANSISTOR |
| 18 | 613 022 2619 | GEAR,IDLER |
| 19 | 613 022 1667 | SPRING,GEAR MAIN |
| 20 | 613 022 2596 | GEAR,MAIN |
| 21 | 613 022 0097 | ASSY,GEAR,LEVER R |
| 22 | 613 022 1674 | SPRING,LINK R |
| 24 | 613 022 4064 | BOARD,UNDER |
| 27 | 613 022 2237 | LEVER,SAFETY SW |
| 28 | 613 022 1827 | SPRING,SAFETY SW |
| 29 | 613 022 1803 | SPRING,DOOR |
| 30 | 613 109 0422 | CASSETTE,DOOR(EXCEPT VHR-8250SP) |
| OR | 613 111 9505 | CASSETTE,DOOR(VHR-8250SP) |
| 31 | 411 001 8702 | SCR BIN 3X6 |
| 40 | 613 100 0391 | ASSY,LEVER,TENSION |
| 41 | 613 085 7996 | SPRING,LEVER TENSION |
| 42 | 613 021 9701 | ASSY,HOLDER,BAND |
| 43 | 411 036 2805 | SCR PAN+SW+W 2.6X6 |
| 44 | 411 109 1605 | WASHER Y 2.6X6X0.25 |
| 45 | 613 022 0127 | ASSY,REEL,SUPPLY |
| 46 | 613 022 0110 | ASSY,REEL,TAKE UP |
| 47 | 412 021 5306 | SPECIAL WASHER 3.1X6X0.3 |
| OR | 412 015 8900 | SPECIAL WASHER 3.1X6X0.4 |
| OR | 412 015 8504 | SPECIAL WASHER 3.1X6X0.5 |
| 48 | 411 109 1506 | WASHER Y 2.1X6X0.25 |
| OR | 411 109 1407 | WASHER Y 2.1X5X0.25 |
| 49 | 613 098 7174 | GEAR,REEL SUPPLY |
| 50 | 412 026 7305 | SPECIAL WASHER 2.6X6X0.25 |
| 51 | 613 098 7181 | GEAR,REEL TAKE UP |
| 54 | 411 031 0905 | SCR BIN 2.6X4 |
| 55 | 613 085 7101 | COMPL,IDLER,CLUTCH |
| 56 | 411 120 1301 | WASHER Y 2.1X4X0.25 |
| 57 | 613 022 0134 | ASSY,IDLER |
| 58 | 411 021 3107 | SCR S-TPG BIN 2.6X8 |
| 59 | 613 078 6302 | COMPL,MC-4 |
| 60 | 407 016 7205 | LED LN59 |
| 61 | 613 021 9985 | ASSY,SLIDE,ACT PLATE |
| 62 | 613 021 9992 | ASSY,SLIDE,C BRAKE |
| 63 | 613 022 1612 | SPRING,RETURN SLIDE |
| 64 | 613 022 1506 | SPRING,SUB T |
| 65 | 613 098 0106 | ASSY,BRAKE,SUB T |
| 66 | 613 077 3647 | PULLEY,REEL |
| 67 | 613 022 1490 | SPRING,SUB SUPPLY |
| 68 | 613 022 2374 | SLIDE,ACT BRAKE |
| 69 | 613 084 8871 | BRAKE,SUB SUPPLY |
| 70 | 613 022 0004 | ASSY,SLIDE,M PLATE |
| 71 | 613 080 9216 | ASSY,BRAKE,SUPPLY |
| 72 | 613 086 2914 | SPRING,MAIN BRAKE |
| 73 | 613 080 9209 | ASSY,BRAKE,TAKE UP |
| 74 | 411 109 3005 | WASHER Y 2.6X5X0.5 |
| 75 | 613 022 2015 | LEVER,CONT PLATE |
| 76 | 412 015 9501 | SPECIAL WASHER |
| 77 | 411 021 7907 | SCR S-TPG BIN 4X12 |



N.S.P.:Not available as service parts

## MECHANISM PARTS 2

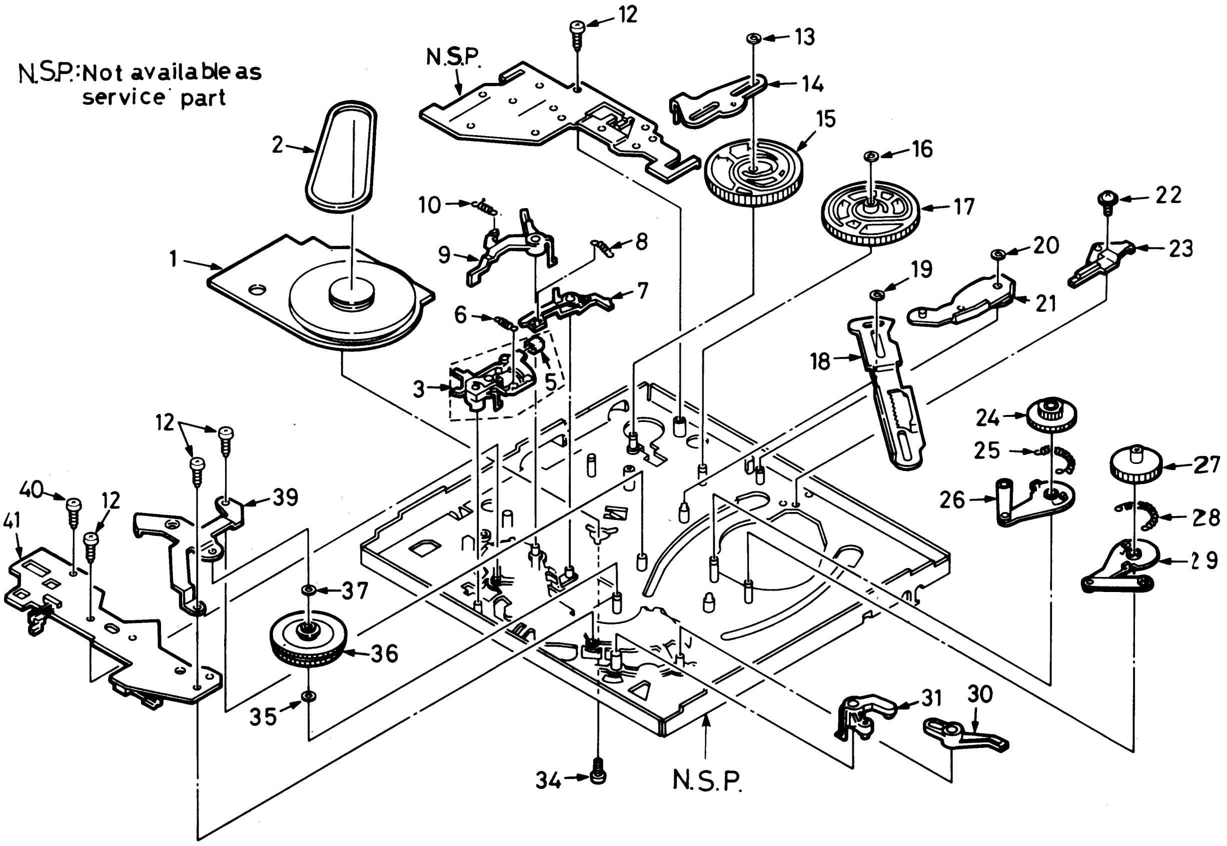
| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| 1 | 613 087 6843 | COMPL,CYLINDER,2N2P-V (EXCEPT VHR-8250SP) |
| OR | 613 078 8665 | COMPL,CYLINDER,2N2P-V (EXCEPT VHR-8250SP) |
| OR | 613 078 8696 | COMPL,CYLINDER,2N2P-L(VHR-8250SP) |
| OR | 613 087 8182 | COMPL,CYLINDER,2N2P-L(VHR-8250SP) |
| 2 | 411 038 1608 | SCR PAN+W 3X8 |
| 3 | 613 087 6850 | ASSY,CYLINDER,UPR 2N2P-V (EXCEPT VHR-8250SP) |
| OR | 613 078 8672 | ASSY,CYLINDER,UPR 2N2P-V (EXCEPT VHR-8250SP) |
| OR | 613 078 8689 | ASSY,CYLINDER,UPR 2N2P-L (VHR-8250SP) |
| OR | 613 087 6867 | ASSY,CYLINDER,UPR 2N2P-L (VHR-8250SP) |
| 4 | 613 022 0271 | ASSY,CYLINDER,LWR 2 |
| OR | 613 077 2138 | ASSY,CYLINDER,LWR 2 |
| 5 | 613 081 4036 | SPACER,MOTOR |
| 6 | 613 022 1001 | BASE,CYLINDER |
| OR | 613 088 9072 | BASE,CYLINDER |
| 7 | 411 047 7509 | SCR PAN+FLG 3X6 |
| 8 | 411 047 5000 | SCR PAN+FLG 2.6X8 |
| OR | 412 030 9708 | SPECIAL SCREW 2.6X8 |
| 9 | 613 085 7279 | STATOR,MOTOR CYL |
| 10 | 411 044 9209 | SCR PAN+SW 2.3X8 |
| OR | 411 044 8301 | SCR PAN+SW 2.3X10 |
| OR | 412 036 4905 | SPECIAL SCREW 2.3X10 |
| 11 | 613 022 4019 | ROTOR,MOTOR CYL |
| 12 | 411 044 9001 | SCR PAN+SW 2.3X6 |
| OR | 412 036 5001 | SPECIAL SCREW 2.3X6 |
| 13 | 613 022 1766 | SPRING,ADJUST GUIDE |
| 14 | 613 053 3227 | SPECIAL WASHER |
| 15 | 613 058 3307 | TAPE GUIDE |
| 16 | 412 026 2607 | SPECIAL NUT (M3) |
| 17 | 613 085 2434 | CAP |
| 18 | 613 021 9961 | ASSY,SLIDE,ACT PINCH |
| 19 | 613 021 9800 | ASSY,LEVER,CAM PINCH |
| 20 | 411 109 2008 | WASHER Y 3.1X8X0.5 |
| 21 | 613 022 1797 | SPRING,ACE HEAD |
| 22 | 613 021 9640 | COMPL,BRACKET,HEAD |
| 23 | 613 051 4615 | SPACER |
| OR | 613 110 1692 | SPACER |
| 24 | 412 015 8207 | SPECIAL NUT (M5) |
| 25 | 411 120 0007 | SCR PAN+SW+W 2.6X5 |
| 26 | 613 022 0752 | BRACKET,STOPPER |
| 27 | 613 022 1575 | SPRING,LINK LOCK |
| 28 | 613 022 1582 | SPRING,SLIDE BRAKE |
| 29 | 613 094 9233 | ASSY,SLIDE,CAM |
| 30 | 613 022 2725 | DAMPER |
| 31 | 613 022 2534 | GEAR,FRONT LOAD |
| 32 | 613 094 1206 | ASSY,LEVER,FRONT |
| 33 | 613 077 3586 | GEAR,HELICAL FRONT |
| 34 | 613 027 0504 | WASHER 4.1X6.5XR5T |
| 35 | 411 046 8002 | SCR PAN+SW+W 2.6X6 |
| 36 | 411 023 2801 | SCR S-TPG PAN 2.6X6 |
| 37 | 411 021 3107 | SCR S-TPG BIN 2.6X8 |
| 40 | 613 053 2381 | SPECIAL WASHER |
| 41 | 613 077 3227 | HOLDER,WORM |
| 42 | 613 027 0382 | WASHER |
| 43 | 613 078 8320 | ASSY,WORM,FRONT |
| 44 | 613 092 5862 | BRACKET.HOLDER |
| 45 | 613 093 9159 | PLATE,NUT |
| 46 | 613 093 8374 | DAMPER,MOTOR |
| 47 | 613 077 3616 | DAMPER,WORM |
| 48 | 613 021 9527 | ASSY,LOADING MOTOR |
| 49 | 613 092 9945 | DAMPER,MOTOR |
| 50 | 613 109 6462 | COMPL,PCB MC-3 |
| 52 | 613 110 0374 | ROTARY SWITCH |
| 53 | 411 126 5303 | SCR PAN 2.6X13 |
| 54 | 613 092 9921 | ASSY,SLIDE,FRONT |
| 55 | 613 092 5985 | SPRING,LEVER LOAD |
| 56 | 613 092 5992 | SPRING,LEVER ACT |
| 57 | 613 092 5886 | HOLDER,WORM |
| 58 | 613 027 0627 | WASHER 2.1X6X0.5 |
| 59 | 613 092 9938 | ASSY,WORM,LOAD |
| 60 | 613 022 2985 | BELT,LOADING |
| 61 | 412 033 4106 | WASHER SLIT 2.6X5X0.50 |
| 62 | 613 077 3579 | GEAR,HELICAL |
| 63 | 613 102 9293 | ASSY.LEVER,REV GUIDE |
| 64 | 613 022 1568 | SPRING,REVIEW LEVER |
| 65 | 613 022 0158 | COMPL,PINCH ROLLER |
| 66 | 613 022 1483 | SPRING,PINCH ROLLER |
| 67 | 411 109 2107 | WASHER Y 3.6X6X0.5 |
| 68 | 613 078 8160 | COMPL,LEVER,ACT BRAKE |
| 69 | 411 031 1209 | SCR BIN 2.6X5 |
| 70 | 613 022 1919 | PLATE,GUIDE |
| 71 | 613 021 9725 | ASSY,BASE,ROLLER S |
| 72 | 613 021 9732 | ASSY,BASE,ROLLER T |
| 73 | 411 063 0904 | SCR SET HEX-SCT 2X3 |
| 74 | 613 022 0233 | ASSY,GUIDE,ROLLER |
| 75 | 411 109 2602 | WASHER Y 1.5X4X0.25 |
| 76 | 613 022 4224 | HEAD,FULL ERASE |
| 77 | 613 022 2817 | IMPEDANCE ROLLER |
| 78 | 412 032 5807 | SPECIAL WASHER 2.1X5X0.13 |
| 79 | 613 093 8305 | ASSY, LEVER,FE HEAD |
| 80 | 613 022 1698 | SPRING,ERASE HEAD |
| 81 | 411 109 1704 | WASHER Y 6.4X10X0.25 |
| 82 | 613 022 1773 | SPRING,GUIDE SUPPLY |



N.S.P.:Not available as service parts

## MECHANISM PARTS 3

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| 1 | 613 087 8854 | MOTOR,CAPSTAN |
| 2 | 613 022 2978 | BELT,REEL DRIVE |
| 3 | 613 021 9848 | ASSY,LEVER,CLUTCH |
| 5 | 613 079 1023 | DAMPER,LEVER CLUTCH |
| 6 | 613 022 1520 | SPRING,LEVER CLUTCH |
| 7 | 613 082 3434 | LEVER,CHANGE CLUTCH |
| 8 | 613 022 1711 | SPRING,CHANGE CLUTCH |
| 9 | 613 088 5470 | ASSY,BRAKE CAPSTAN |
| 10 | 613 092 7156 | SPRING,CAPSTAN |
| 12 | 411 021 3107 | SCR S-TPG BIN 2.6X8 |
| 13 | 411 109 2008 | WASHER Y 3.1X8X0.5 |
| 14 | 613 021 9978 | ASSY,SLIDE,CAM PLATE |
| 15 | 613 022 2701 | CAM,MODE |
| 16 | 411 109 1902 | WASHER Y 3.1X6X0.5 |
| 17 | 613 022 2718 | CAM,MAIN |
| 18 | 613 022 2664 | RACK,LOAD |
| 19 | 411 109 1803 | WASHER Y 2.6X6X0.5 |
| 20 | 411 109 2107 | WASHER Y 3.6X6X0.5 |
| OR | 411 109 2206 | WASHER Y 3.6X8X0.5 |
| 21 | 613 021 9794 | ASSY,LEVER,CAM LOAD |
| 22 | 411 047 6809 | SCR PAN+FLG 3X4 |
| 23 | 613 021 9763 | ASSY,EARTH,CYL |
| 24 | 613 090 6380 | GEAR,LOAD TAKE UP |
| 25 | 613 022 1551 | SPRING,GEAR LOAD T |
| 26 | 613 021 9879 | ASSY,LEVER,LOAD T |
| 27 | 613 090 6373 | GEAR,LOAD SUPPLY |
| 28 | 613 022 1704 | SPRING,GEAR LOAD S |
| 29 | 613 021 9862 | ASSY,LEVER,LOAD S |
| 30 | 613 022 2039 | LEVER,RETURN TENSION |
| 31 | 613 091 3104 | ASSY,LEVER CONTROL |
| 34 | 411 040 2303 | SCR PAN 2.6X5 |
| 35 | 412 015 8603 | SPECIAL WASHER 3.1X6X0.25 |
| 36 | 613 102 0900 | ASSY,GEAR,FRICTION |
| 37 | 411 109 1605 | WASHER Y 2.6X6X0.25 |
| 39 | 613 079 8121 | BRACKET,PULLEY |
| 40 | 411 100 0300 | SCR S-TPG BIN 2.6X5 |
| 41 | 613 110 1340 | COMPL,MC-1 |
| D1 | 407 094 1300 | PHOTO COUPLE SPI-315-04-C |
| OR | 407 043 0101 | PHOTO DIODE ON2170-R |
| R1 | 401 026 0607 | CARBON 270 JA 1/6W |
| OR | 401 017 0708 | CARBON 270 JA 1/4W |
| R2 | 401 024 6700 | CARBON 100 JA 1/6W |
| OR | 401 012 4404 | CARBON 100 JA 1/4W |
| SW1 | 613 022 4545 | SPECIAL SWITCH,EP. |



# ELECTRICAL PARTS

**NOTE;**

*Materials of Capacitors and Resistors are abbreviated as follows;

Resistors

| | |
|---|---|
| MT-FILE | Metal Film Resistor |
| MT-GLAZE | Metal Glaze Resistor |
| OXIDE-MT | Oxide Metal Film Resistor |

Capacitors

| | |
|---|---|
| MT-POLYEST | Metallized Polyester Capacitor |
| MT-COMPO | Metallized Composite Capacitor |
| TA-SOLID | Tantalum Solid Capacitor |
| AL-SOLID | Aluminum Solid Capacitor |
| NP-ELECT | Non-Polarized Electrolytic Capacitor |
| OS-SOLID | Aluminum Solid Capacitors with Organic Semiconductive Electrolytic Capacitor |
| DL-ELECT | Double Layered Electrolytic Capacitor |

*Tolerance of Capacitor(10pF over) and Resistor are noted with follow symboles.

F ············ ±1%  G ············ ±2%  J ············ ±5%  K ············ ±10%

M ············ ±20%  N ············ ±30%  Z ············ +80% ~ −20%

*N.S.P. : Not available as service parts.

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| **COMPL,CP-A** | | |
| COMPL.NO. | 613 109 0682 | (VHR-7200G) |
| COMPL.NO. | 613 110 5706 | (VHR-7100G) |
| COMPL.NO. | 613 109 0699 | (VHR-7200EX) |
| COMPL.NO. | 613 110 2040 | (VHR-7100EX) |
| COMPL.NO. | 613 109 1795 | (VHR-8200SP) |
| COMPL.NO. | 613 109 1801 | (VHR-8100SP) |
| COMPL.NO. | 613 113 4485 | (VHR-8250SP) |
| **VIDEO CIRCUIT(VD-A)** | | |
| B1001 | 405 000 6104 | TR DTC144ES-DCTP |
| OR | 405 018 2501 | TR 2SC3399-AC |
| B1201 | 405 000 6104 | TR DTC144ES-DCTP<br>(VHR-7200G,EX,7100G,EX) |
| OR | 405 018 2501 | TR 2SC3399-AC<br>(VHR-7200G,EX,7100G,EX) |
| B1651 | 405 000 6104 | TR DTC144ES-DCTP |
| OR | 405 018 2501 | TR 2SC3399-AC |
| C1001 | 403 025 7007 | CERAMIC 4.7P D 50V |
| C1002 | 403 073 2702 | CERAMIC 390P J 50V |
| C1003 | 403 026 2209 | CERAMIC 47P J 50V |
| C1004 | 403 179 4501 | NP-ELECT 0.47U M 50V |
| C1005 | 403 150 1703 | CERAMIC 91P J 50V |
| C1006 | 403 071 1509 | CERAMIC 180P J 50V |
| C1007 | 403 075 4001 | CERAMIC 820P J 50V |
| C1008 | 403 134 4706 | NP-ELECT 2.2U M 50V |
| C1009 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1010 | 403 121 3408 | ELECT 2.2U M 50V |
| C1011 | 403 130 2904 | ELECT 0.47U M 50V |
| C1012 | 403 075 3103 | CERAMIC 82P J 50V |
| C1013 | 403 068 8801 | CERAMIC 100P J 50V |
| C1014 | 403 063 2200 | POLYESTER 0.068U K 50V |
| C1015 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1016 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1017 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1018 | 403 135 4002 | ELECT 47U M 6.3V |
| C1019 | 403 121 3408 | ELECT 2.2U M 50V |
| C1020 | 403 107 9905 | ELECT 10U M 16V |
| C1021 | 403 121 3408 | ELECT 2.2U M 50V |
| C1023 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1024 | 403 121 2104 | ELECT 22U M 10V |
| C1025 | 403 130 2904 | ELECT 0.47U M 50V |
| C1031 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1032 | 403 135 5009 | ELECT 47U M 10V |
| C1033 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1034 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1035 | 403 135 5009 | ELECT 47U M 10V |
| C1036 | 403 139 2707 | ELECT 1U M 50V |
| C1037 | 403 026 2209 | CERAMIC 47P J 50V |
| C1038 | 403 025 7007 | CERAMIC 4.7P D 50V |
| C1039 | 403 026 2209 | CERAMIC 47P J 50V |
| C1040 | 403 139 2202 | ELECT 4.7U M 25V |
| C1041 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1042 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1043 | 403 073 6205 | CERAMIC 470P J 50V |
| C1051 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1058 | 403 026 2209 | CERAMIC 47P J 50V |
| C1059 | 403 028 3402 | CERAMIC 56P J 50V |
| C1060 | 403 135 4002 | ELECT 47U M 6.3V |
| C1061 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1062 | 403 074 8703 | CERAMIC 680P J 50V |
| C1063 | 403 022 7703 | CERAMIC 33P J 50V |
| C1065 | 403 022 7703 | CERAMIC 33P J 50V |
| C1101 | 403 003 2505 | CERAMIC 0.022U J 25V |
| C1102 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1103 | 403 109 6308 | ELECT 1U M 50V |
| C1104 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1105 | 403 109 6308 | ELECT 1U M 50V |
| C1106 | 403 109 6308 | ELECT 1U M 50V |
| C1107 | 403 003 2505 | CERAMIC 0.022U J 25V |
| C1108 | 403 104 8505 | CERAMIC 0.047U J 25V |
| C1109 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1112 | 403 109 6308 | ELECT 1U M 50V |
| C1113 | 403 104 8505 | CERAMIC 0.047U J 25V |
| C1114 | 403 025 8608 | CERAMIC 43P J 50V |
| C1115 | 403 150 1703 | CERAMIC 91P J 50V |
| C1116 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1117 | 403 135 4002 | ELECT 47U M 6.3V |
| C1118 | 403 068 8801 | CERAMIC 100P J 50V |
| C1119 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1121 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1124 | 403 073 8407 | CERAMIC 4700P K 50V |
| C1125 | 403 070 3702 | CERAMIC 120P J 50V |
| C1126 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1201 | 403 072 7500 | CERAMIC 330P J 50V<br>(VHR-7200G,EX,7100G,EX) |
| C1281 | 403 073 6205 | CERAMIC 470P J 50V<br>(VHR-7200G,EX,7100G,EX) |
| OR | 403 075 4001 | CERAMIC 820P J 50V<br>(VHR-8200SP,8100SP,8250SP) |
| C1301 | 403 003 2406 | CERAMIC 0.022U J 25V<br>(VHR-8250SP) |
| C1351 | 403 022 7703 | CERAMIC 33P J 50V<br>(VHR-8250SP) |
| C1352 | 403 014 2600 | CERAMIC 18P J 50V<br>(VHR-8250SP) |
| C1401 | 403 139 2202 | ELECT 4.7U M 25V |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| C1601 | 403 135 4002 | ELECT 47U M 6.3V |
| C1602 | 403 135 4002 | ELECT 47U M 6.3V |
| C1605 | 403 135 4101 | ELECT 470U M 6.3V |
| C1608 | 403 121 2104 | ELECT 22U M 10V |
| C1609 | 403 093 9606 | OS-SOLID 1U M 16V |
| C1631 | 403 022 7703 | CERAMIC 33P J 50V |
| C1632 | 403 024 1501 | CERAMIC 39P J 50V |
| C1681 | 403 068 9402 | CERAMIC 100P K 50V<br>(VHR-7200G,EX,7100G,EX) |
| C1682 | 403 012 6006 | CERAMIC 15P J 50V<br>(VHR-7200G,EX,7100G,EX) |
| CN165 | 613 009 1635 | SOCKET 21P |
| D1001 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D1002 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D1003 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D1004 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D1031 | 407 070 8408 | ZENER DIODE GZS9.1Y-TB |
| OR | 407 053 8906 | ZENER DIODE MTZ9.1C-T-77 |
| D1301 | 407 007 9904 | DIODE GMA01-BT(VHR-8250SP) |
| OR | 407 012 4406 | DIODE 1SS133-T-77(VHR-8250SP) |
| D1302 | 407 007 9904 | DIODE GMA01-BT(VHR-8250SP) |
| OR | 407 012 4406 | DIODE 1SS133-T-77(VHR-8250SP) |
| D1303 | 407 007 9904 | DIODE GMA01-BT(VHR-8250SP) |
| OR | 407 012 4406 | DIODE 1SS133-T-77(VHR-8250SP) |
| D1304 | 407 007 9904 | DIODE GMA01-BT(VHR-8250SP) |
| OR | 407 012 4406 | DIODE 1SS133-T-77(VHR-8250SP) |
| D1601 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D1602 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D1604 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D1651 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D1652 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| DL131 | 613 110 0367 | DELAY,2H |
| OR | 613 110 1708 | DELAY,2H |
| IC101 | 409 178 3309 | IC LA7340 |
| IC102 | 409 148 4800 | IC TL8709P |
| IC111 | 409 208 7208 | IC LA7332 |
| IC161 | 409 120 3401 | IC LA7221 |
| L1001 | 613 014 0951 | HF CHOKE 68UH K |
| L1031 | 613 014 0968 | HF CHOKE 82UH K |
| L1033 | 613 014 0739 | HF CHOKE 1.0UH M |
| L1054 | 613 014 0876 | HF CHOKE 15UH K |
| L1055 | 613 014 0876 | HF CHOKE 15UH K |
| L1056 | 613 014 0975 | HF CHOKE 100UH K |
| L1057 | 613 014 0821 | HF CHOKE 5.6UH K |
| L1058 | 613 014 0944 | HF CHOKE 56UH K |
| L1101 | 613 014 0883 | HF CHOKE 18UH K |
| L1102 | 613 014 0791 | HF CHOKE 3.3UH K |
| L1103 | 613 014 0876 | HF CHOKE 15UH K |
| L1104 | 613 015 6327 | HF CHOKE 1MH J |
| L1105 | 613 014 0937 | HF CHOKE 47UH K |
| L1631 | 613 014 0975 | HF CHOKE 100UH K |
| L1681 | 613 014 0777 | HF CHOKE 2.2UH M<br>(VHR-7200G,EX,7100G,EX) |
| Q1001 | 405 093 0508 | TR KSA1175-Y |
| Q1001 | 405 004 4007 | TR 2SA608-E-SPA-AC |
| OR | 405 004 4601 | TR 2SA608-F-SPA-AC |
| OR | 405 006 1707 | TR 2SA933S-TP-Q |
| OR | 405 006 1806 | TR 2SA933S-T93-R |
| Q1002 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1003 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1031 | 405 093 0508 | TR KSA1175-Y |
| OR | 405 004 4007 | TR 2SA608-E-SPA-AC |
| OR | 405 004 4601 | TR 2SA608-F-SPA-AC |
| OR | 405 006 1707 | TR 2SA933S-TP-Q |
| OR | 405 006 1806 | TR 2SA933S-T93-R |
| Q1052 | 405 012 9506 | TR 2SC2058S-DCTP-Q |
| OR | 405 015 2504 | TR 2SC2669-O-TPE4 |
| OR | 405 015 2603 | TR 2SC2669-Y-TPE4 |
| OR | 405 016 0905 | TR 2SC2839-E-SPA-AC |
| OR | 405 016 1100 | TR 2SC2839-F-SPA-AC |
| Q1054 | 405 012 9506 | TR 2SC2058S-DCTP-Q |
| OR | 405 015 2504 | TR 2SC2669-O-TPE4 |
| OR | 405 015 2603 | TR 2SC2669-Y-TPE4 |
| OR | 405 016 0905 | TR 2SC2839-E-SPA-AC |
| OR | 405 016 1100 | TR 2SC2839-F-SPA-AC |
| Q1055 | 405 012 9506 | TR 2SC2058S-DCTP-Q |
| OR | 405 015 2504 | TR 2SC2669-O-TPE4 |
| OR | 405 015 2603 | TR 2SC2669-Y-TPE4 |
| OR | 405 016 0905 | TR 2SC2839-E-SPA-AC |
| OR | 405 016 1100 | TR 2SC2839-F-SPA-AC |
| Q1101 | 405 093 0508 | TR KSA1175-Y |
| OR | 405 004 4007 | TR 2SA608-E-SPA-AC |
| OR | 405 004 4601 | TR 2SA608-F-SPA-AC |
| OR | 405 006 1707 | TR 2SA933S-TP-Q |
| OR | 405 006 1806 | TR 2SA933S-T93-R |
| Q1102 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1103 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1104 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1105 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1106 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1151 | 405 004 4007 | TR 2SA608-E-SPA-AC |
| OR | 405 004 4601 | TR 2SA608-F-SPA-AC |
| OR | 405 006 1707 | TR 2SA933S-TP-Q |
| OR | 405 006 1806 | TR 2SA933S-T93-R |
| OR | 405 093 0508 | TR KSA1175-Y |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| Q1301 | 405 093 0508 | TR KSA1175-Y(VHR-8250SP) |
| OR | 405 004 4007 | TR 2SA608-E-SPA-AC(VHR-8250SP) |
| OR | 405 004 4601 | TR 2SA608-F-SPA-AC(VHR-8250SP) |
| OR | 405 006 1707 | TR 2SA933S-TP-Q(VHR-8250SP) |
| OR | 405 006 1806 | TR 2SA933S-TP-R(VHR-8250SP) |
| Q1302 | 405 093 0607 | TR KSC2785-Y(VHR-8250SP) |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q(VHR-8250SP) |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R(VHR-8250SP) |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC(VHR-8250SP) |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC(VHR-8250SP) |
| Q1401 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1402 | 405 006 6504 | TR 2SA984-E-AA |
| OR | 405 006 6702 | TR 2SA984-F-AA |
| Q1403 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1404 | 405 089 0109 | TR 2SA1707-T-AN |
| OR | 405 084 7905 | TR 2SB1240-TV2-R |
| Q1601 | 405 004 4601 | TR 2SA608-F-SPA-AC |
| OR | 405 006 1806 | TR 2SA933S-T93-R |
| Q1602 | 405 093 0508 | TR KSA1175-Y |
| OR | 405 004 4007 | TR 2SA608-E-SPA-AC |
| OR | 405 004 4601 | TR 2SA608-F-SPA-AC |
| OR | 405 006 1707 | TR 2SA933S-TP-Q |
| OR | 405 006 1806 | TR 2SA933S-T93-R |
| Q1631 | 405 093 0607 | TR KSC2785-Y |
| OR | 405 011 8401 | TR 2SC1740S-DCTP-Q |
| OR | 405 011 8500 | TR 2SC1740S-DCTP-R |
| OR | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| Q1651 | 405 093 0508 | TR KSA1175-Y |
| OR | 405 004 4007 | TR 2SA608-E-SPA-AC |
| OR | 405 004 4601 | TR 2SA608-F-SPA-AC |
| OR | 405 006 1707 | TR 2SA933S-TP-Q |
| OR | 405 006 1806 | TR 2SA933S-T93-R |
| R1001 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1002 | 401 017 1705 | CARBON 2.7K JA 1/4W |
| R1003 | 401 022 1806 | CARBON 680 JA 1/4W |
| R1004 | 401 012 9201 | CARBON 1M JA 1/4W |
| R1005 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1006 | 401 017 1705 | CARBON 2.7K JA 1/4W |
| R1007 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1008 | 401 022 1806 | CARBON 680 JA 1/4W |
| R1009 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1010 | 401 017 8506 | CARBON 300 JA 1/4W |
| R1011 | 401 015 2605 | CARBON 1.8K JA 1/4W |
| R1012 | 401 015 4609 | CARBON 180K JA 1/4W |
| R1013 | 401 012 9201 | CARBON 1M JA 1/4W |
| R1014 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R1015 | 401 023 2703 | CARBON 8.2K JA 1/4W |
| R1016 | 401 013 5202 | CARBON 1.2K JA 1/4W |
| R1017 | 401 018 4804 | CARBON 33K JA 1/4W |
| R1018 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1019 | 401 016 2505 | CARBON 220 JA 1/4W |
| R1020 | 401 020 3802 | CARBON 470K JA 1/4W |
| R1021 | 401 014 6000 | CARBON 150K JA 1/4W |
| R1022 | 401 022 1806 | CARBON 680 JA 1/4W |
| R1023 | 401 016 4707 | CARBON 22K JA 1/4W |
| R1024 | 401 020 2805 | CARBON 47K JA 1/4W |
| R1025 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R1031 | 401 019 9501 | CARBON 47 JA 1/4W |
| R1032 | 401 019 9501 | CARBON 47 JA 1/4W |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| R1033 | 401 021 0602 | CARBON 56 JA 1/4W |
| R1034 | 401 020 7800 | CARBON 510 JA 1/4W |
| R1035 | 401 021 8103 | CARBON 620 JA 1/4W |
| R1051 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R1052 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R1056 | 401 019 0904 | CARBON 390 JA 1/4W |
| R1057 | 401 022 7105 | CARBON 750 JA 1/4W |
| R1066 | 401 023 1607 | CARBON 820 JA 1/4W |
| R1067 | 401 023 1607 | CARBON 820 JA 1/4W |
| R1068 | 401 021 1807 | CARBON 560 JA 1/4W |
| R1069 | 401 017 0708 | CARBON 270 JA 1/4W |
| R1070 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1071 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1072 | 401 019 0904 | CARBON 390 JA 1/4W |
| R1101 | 401 020 2805 | CARBON 47K JA 1/4W |
| R1102 | 401 016 4707 | CARBON 22K JA 1/4W |
| R1103 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1104 | 401 013 5202 | CARBON 1.2K JA 1/4W |
| R1105 | 401 018 2701 | CARBON 330 JA 1/4W |
| R1106 | 401 021 1807 | CARBON 560 JA 1/4W |
| R1107 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1108 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1109 | 401 012 6903 | CARBON 10K JA 1/4W |
| R1110 | 401 023 2703 | CARBON 8.2K JA 1/4W |
| R1111 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1112 | 401 015 2605 | CARBON 1.8K JA 1/4W |
| R1113 | 401 012 8006 | CARBON 100K JA 1/4W |
| R1114 | 401 020 7800 | CARBON 510 JA 1/4W |
| R1115 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1116 | 401 019 1802 | CARBON 3.9K JA 1/4W |
| R1117 | 401 014 4006 | CARBON 1.5K JA 1/4W |
| R1118 | 401 022 7105 | CARBON 750 JA 1/4W |
| R1119 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1120 | 401 012 4404 | CARBON 100 JA 1/4W |
| R1121 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1122 | 401 020 0702 | CARBON 470 JA 1/4W |
| R1123 | 401 014 4006 | CARBON 1.5K JA 1/4W |
| R1124 | 401 015 8805 | CARBON 200 JA 1/4W |
| R1125 | 401 023 1607 | CARBON 820 JA 1/4W |
| R1126 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1127 | 401 014 8202 | CARBON 160 JA 1/4W |
| R1128 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1129 | 401 018 2701 | CARBON 330 JA 1/4W |
| R1152 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1301 | 401 012 6903 | CARBON 10K JA 1/4W (VHR-8250SP) |
| R1302 | 401 012 5609 | CARBON 1K JA 1/4W (VHR-8250SP) |
| R1303 | 401 012 5609 | CARBON 1K JA 1/4W (VHR-8250SP) |
| R1304 | 401 020 2805 | CARBON 47K JA 1/4W (VHR-8250SP) |
| R1305 | 401 016 4707 | CARBON 22K JA 1/4W (VHR-8250SP) |
| R1306 | 401 015 4609 | CARBON 180K JA 1/4W (VHR-8250SP) |
| R1351 | 401 016 3700 | CARBON 2.2K JA 1/4W (VHR-8250SP) |
| R1352 | 401 016 3700 | CARBON 2.2K JA 1/4W (VHR-8250SP) |
| R1401 | 401 016 4707 | CARBON 22K JA 1/4W |
| R1402 | 401 016 4707 | CARBON 22K JA 1/4W |
| R1403 | 401 023 2703 | CARBON 8.2K JA 1/4W |
| R1404 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R1405 | 401 020 2805 | CARBON 47K JA 1/4W |
| R1406 | 401 020 2805 | CARBON 47K JA 1/4W |
| R1407 | 401 015 2605 | CARBON 1.8K JA 1/4W |
| R1408 | 401 016 2505 | CARBON 220 JA 1/4W |
| R1602 | 401 022 6702 | CARBON 75 JA 1/4W |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| R1603 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1606 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1607 | 401 021 1807 | CARBON 560 JA 1/4W |
| R1608 | 401 022 6702 | CARBON 75 JA 1/4W |
| R1609 | 401 013 9408 | CARBON 1.3K JA 1/4W |
| R1610 | 401 021 1807 | CARBON 560 JA 1/4W |
| R1631 | 401 021 2903 | CARBON 5.6K JA 1/4W |
| R1632 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1633 | 401 023 1607 | CARBON 820 JA 1/4W |
| R1634 | 401 015 2605 | CARBON 1.8K JA 1/4W |
| R1641 | 401 015 2605 | CARBON 1.8K JA 1/4W |
| R1651 | 401 012 6903 | CARBON 10K JA 1/4W |
| R1652 | 401 012 5609 | CARBON 1K JA 1/4W |
| R1653 | 401 021 2903 | CARBON 5.6K JA 1/4W |
| R1654 | 401 021 2903 | CARBON 5.6K JA 1/4W |
| R1655 | 401 016 4707 | CARBON 22K JA 1/4W |
| R1656 | 401 021 0602 | CARBON 56 JA 1/4W |
| R1661 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| VR101 | 613 001 9370 | SEMI VR 1KB |
| OR | 613 001 8977 | SEMI VR 1KB |
| VR102 | 613 001 9035 | SEMI VR 10KB |
| OR | 613 001 9417 | SEMI VR 10KB |
| VR103 | 613 001 9424 | SEMI VR 20KB |
| OR | 613 001 9059 | SEMI VR 22KB |
| VR104 | 613 001 9035 | SEMI VR 10KB |
| OR | 613 001 9417 | SEMI VR 10KB |
| VR105 | 613 001 8977 | SEMI VR 1KB |
| OR | 613 001 9370 | SEMI VR 1KB |
| VR361 | 613 094 6034 | VR,ROTARY 100KB |
| X1101 | 613 080 9407 | OSC,CRYSTAL 4.43MHZ |
| OR | 613 093 8008 | OSC,CRYSTAL 4.433619MHZ |
| XF101 | 613 004 5539 | LC PACK 4MHZ LPF |
| XF111 | 613 004 5485 | LC PACK |

## AUDIO CIRCUIT(AD-A)

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| B2101 | 405 018 2501 | TR 2SC3399-AC |
| OR | 405 000 6104 | TR DTC144ES-DCTP |
| C2001 | 403 049 1401 | ELECT 1U M 50V |
| C2002 | 403 075 4506 | CERAMIC 820P K 50V |
| C2004 | 403 135 3708 | ELECT 33U M 6.3V |
| C2005 | 403 003 0600 | CERAMIC 0.018U K 25V |
| C2006 | 403 130 2904 | ELECT 0.47U M 50V |
| C2008 | 403 001 6505 | CERAMIC 3300P K 16V |
| C2009 | 403 135 4002 | ELECT 47U M 6.3V |
| C2010 | 403 107 9905 | ELECT 10U M 16V |
| C2013 | 403 003 2406 | CERAMIC 0.022U J 25V |
| C2016 | 403 109 6308 | ELECT 1U M 50V |
| C2017 | 403 134 5901 | ELECT 33U M 16V |
| C2018 | 403 121 3002 | ELECT 4.7U M 25V |
| C2019 | 403 134 9602 | ELECT 47U M 16V |
| C2020 | 403 071 6207 | CERAMIC 220P K 50V |
| C2021 | 403 081 7409 | POLYPRO 0.033U J 100V |
| C2022 | 403 002 1905 | CERAMIC 0.01U K 25V |
| C2024 | 403 002 1905 | CERAMIC 0.01U K 25V |
| C2025 | 403 003 3700 | CERAMIC 0.022U Z 25V |
| C2051 | 403 069 1207 | CERAMIC 1000P K 50V<br>(VHR-7200G,7100G) |
| C2071 | 403 075 4506 | CERAMIC 820P K 50V<br>(VHR-8250SP) |
| C2072 | 403 109 6308 | ELECT 1U M 50V<br>(VHR-8250SP) |
| C2073 | 403 003 8606 | CERAMIC 0.039U J 25V<br>(VHR-8250SP) |
| C2151 | 403 069 1207 | CERAMIC 1000P K 50V |
| C2152 | 403 069 1207 | CERAMIC 1000P K 50V |
| D2101 | 407 012 4406 | DIODE 1SS133-T-77 |
| OR | 407 007 9904 | DIODE GMA01-BT |
| D2102 | 407 012 4406 | DIODE 1SS133-T-77 |
| OR | 407 007 9904 | DIODE GMA01-BT |
| IC201 | 409 133 1401 | IC LA7294 |
| L2002 | 613 014 3037 | HF CHOKE 10MH J |
| L2003 | 613 014 2870 | HF CHOKE 560UH K |
| L2151 | 613 014 0739 | HF CHOKE 1.0UH M(VHR-7200G,7100G) |
| OR | 613 014 4256 | HF CHOKE 1.0UH K(VHR-7200G,7100G) |
| Q2001 | 405 024 9709 | TR 2SD734-E-AA |
| OR | 405 024 9907 | TR 2SD734-F-AA |
| Q2101 | 405 033 6706 | TR 2SD1468S-DCTP-R |
| OR | 405 033 6805 | TR 2SD1468S-DCTP-S |
| Q2102 | 405 033 6706 | TR 2SD1468S-DCTP-R |
| OR | 405 033 6805 | TR 2SD1468S-DCTP-S |
| R2001 | 401 012 4404 | CARBON 100 JA 1/4W |
| R2002 | 401 022 3008 | CARBON 6.8K JA 1/4W |
| R2003 | 401 023 0600 | CARBON 82 JA 1/4W |
| R2004 | 401 019 3905 | CARBON 390K JA 1/4W |
| R2005 | 401 021 8905 | CARBON 6.2K JA 1/4W |
| R2006 | 401 017 1705 | CARBON 2.7K JA 1/4W |
| R2009 | 401 018 6501 | CARBON 3.3M JA 1/4W |
| R2010 | 401 012 6903 | CARBON 10K JA 1/4W |
| R2011 | 401 016 0006 | CARBON 20K JA 1/4W |
| R2012 | 401 022 7600 | CARBON 7.5K JA 1/4W |
| R2013 | 401 012 5609 | CARBON 1K JA 1/4W |
| R2014 | 401 015 2605 | CARBON 1.8K JA 1/4W |
| R2016 | 401 012 6903 | CARBON 10K JA 1/4W |
| R2017 | 401 012 6903 | CARBON 10K JA 1/4W |
| R2018 | 401 015 3701 | CARBON 18K JA 1/4W |
| R2019 | 401 015 3701 | CARBON 18K JA 1/4W |
| R2021 | 401 012 3308 | CARBON 10 JA 1/4W |
| R2022 | 401 019 9501 | CARBON 47 JA 1/4W |
| R2023 | 401 014 5102 | CARBON 15K JA 1/4W |
| R2024 | 401 019 6104 | CARBON 4.7 JA 1/4W |
| R2051 | 401 012 5609 | CARBON 1K JA 1/4W<br>(VHR-7200G,7100G) |
| R2071 | 401 013 4106 | CARBON 120 JA 1/4W<br>(VHR-8250SP) |
| R2072 | 401 012 6903 | CARBON 10K JA 1/4W<br>(VHR-8250SP) |
| R2101 | 401 020 2805 | CARBON 47K JA 1/4W |
| R2102 | 401 019 2908 | CARBON 39K JA 1/4W |
| R2103 | 401 020 2805 | CARBON 47K JA 1/4W |
| R2104 | 401 015 3701 | CARBON 18K JA 1/4W |
| R2105 | 401 012 5609 | CARBON 1K JA 1/4W |
| R2106 | 401 014 8509 | CARBON 1.6K JA 1/4W |
| R2107 | 401 017 1705 | CARBON 2.7K JA 1/4W |
| R2108 | 401 017 1705 | CARBON 2.7K JA 1/4W |
| R2109 | 401 012 5609 | CARBON 1K JA 1/4W |
| R2110 | 401 023 1607 | CARBON 820 JA 1/4W |
| R2111 | 401 012 6903 | CARBON 10K JA 1/4W |
| R2112 | 401 012 6903 | CARBON 10K JA 1/4W |
| R2113 | 401 012 6903 | CARBON 10K JA 1/4W |
| R2114 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R2115 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| T2001 | 613 016 2205 | OSC COIL 70KHZ |
| OR | 613 094 3378 | TRANS,OSC 70KHZ |
| VR201 | 613 001 9097 | SEMI VR 100KB |
| VR202 | 613 001 9035 | SEMI VR 10KB |

## SYSTEM CONTROL CIRCUIT(SY-A)

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| B3001 | 405 000 3103 | TR DTC114ES-DCTP |
| OR | 405 018 2808 | TR 2SC3402-AC |
| B3002 | 405 000 6104 | TR DTC144ES-DCTP(EXCEPT VHR-8250SP) |
| OR | 405 018 2501 | TR 2SC3399-AC(EXCEPT VHR-8250SP) |
| C3001 | 403 002 2506 | CERAMIC 0.01U M 25V |
| C3002 | 403 002 4807 | CERAMIC 0.1U Z 25V |
| C3003 | 403 121 3408 | ELECT 2.2U M 50V |
| C3004 | 403 135 3708 | ELECT 33U M 6.3V |
| C3005 | 403 001 3108 | CERAMIC 0.1U Z 16V |
| C3006 | 403 001 3108 | CERAMIC 0.1U Z 16V |
| C3007 | 403 001 3108 | CERAMIC 0.1U Z 16V |
| C3008 | 403 134 8100 | ELECT 100U M 6.3V |
| C3009 | 403 001 3108 | CERAMIC 0.1U Z 16V |
| C3012 | 403 155 2804 | DL-ELECT 0.047F Z 5.5V |
| D3001 | 407 051 6904 | ZENER DIODE GZS5.6Y-BT |
| OR | 407 099 5303 | ZENER DIODE MTZJ5.6B-T-77 |
| D3002 | 407 070 8101 | ZENER DIODE GZS8.2Y-BT |
| OR | 407 063 9504 | ZENER DIODE MTZJ8.2B-T-77 |
| IC301 | 410 094 5902 | IC LC66308A-4410 |
| IC302 | 409 114 4803 | IC LB1641 |
| IC303 | 409 167 9800 | IC BA10393 |
| OR | 409 018 3902 | IC LA6393D |
| OR | 409 057 3406 | IC UPC393C |
| IC304 | 409 032 3704 | IC MN1280-R |
| OR | 409 032 3803 | IC MN1280-S |
| R3001 | 402 036 4401 | FUSIBLE RES 3.3 JA 1/2W |
| R3002 | 401 022 7105 | CARBON 750 JA 1/4W |
| R3003 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3004 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3005 | 401 022 7105 | CARBON 750 JA 1/4W |
| R3006 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3007 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3008 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3009 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3010 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3011 | 401 012 5609 | CARBON 1K JA 1/4W |
| R3012 | 401 012 5609 | CARBON 1K JA 1/4W |
| R3013 | 401 012 5609 | CARBON 1K JA 1/4W |
| R3014 | 401 012 5609 | CARBON 1K JA 1/4W |
| R3015 | 401 012 5609 | CARBON 1K JA 1/4W |
| R3016 | 401 012 5609 | CARBON 1K JA 1/4W |
| R3017 | 401 014 4006 | CARBON 1.5K JA 1/4W |
| R3018 | 401 022 3008 | CARBON 6.8K JA 1/4W |
| R3019 | 401 013 7206 | CARBON 120K JA 1/4W |
| R3020 | 401 017 9701 | CARBON 30K JA 1/4W |
| R3021 | 401 017 9701 | CARBON 30K JA 1/4W |
| R3022 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3023 | 401 016 0006 | CARBON 20K JA 1/4W |
| R3024 | 401 021 4006 | CARBON 56K JA 1/4W |
| R3025 | 401 014 6000 | CARBON 150K JA 1/4W |
| R3026 | 401 016 4707 | CARBON 22K JA 1/4W |
| R3032 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3033 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3034 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3035 | 401 020 1907 | CARBON 4.7K JA 1/4W |
| R3036 | 401 019 1802 | CARBON 3.9K JA 1/4W |
| R3037 | 401 012 8006 | CARBON 100K JA 1/4W |
| R3038 | 401 012 8006 | CARBON 100K JA 1/4W |
| R3039 | 401 012 8006 | CARBON 100K JA 1/4W |
| R3040 | 401 023 4509 | CARBON 820K JA 1/4W |
| R3041 | 401 012 5609 | CARBON 1K JA 1/4W |
| R3042 | 401 012 5609 | CARBON 1K JA 1/4W |
| R3046 | 401 020 1907 | CARBON 4.7K JA 1/4W (EXCEPT VHR-8250SP) |
| R3047 | 401 014 4006 | CARBON 1.5K JA 1/4W |
| R3048 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3101 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3103 | 401 012 6903 | CARBON 10K JA 1/4W (VHR-8250SP) |
| R3105 | 401 012 6903 | CARBON 10K JA 1/4W |
| XF301 | 613 079 7414 | CERAMIC RESONATOR 4.0MHZ |
| OR | 613 108 2496 | RESONATOR,CERAMIC 4.0MHZ |

## SERVO CIRCUIT(SV-A)

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| B3501 | 405 000 6104 | TR DTC144ES-DCTP |
| OR | 405 018 2501 | TR 2SC3399-AC |
| B3502 | 405 000 6104 | TR DTC144ES-DCTP |
| OR | 405 018 2501 | TR 2SC3399-AC |
| B3503 | 405 000 6104 | TR DTC144ES-DCTP |
| OR | 405 018 2501 | TR 2SC3399-AC |
| B3504 | 405 000 2205 | TR DTA144ES-DCTP(VHR-8250SP) |
| OR | 405 003 7603 | TR 2SA1345-AC(VHR-8250SP) |
| C3502 | 403 001 3108 | CERAMIC 0.1U Z 16V |
| C3503 | 403 059 6502 | POLYESTER 0.022U K 50V |
| C3504 | 403 057 8009 | POLYESTER 0.01U K 50V |
| C3506 | 403 057 6801 | POLYESTER 0.012U J 50V |
| C3507 | 403 063 7700 | POLYESTER 0.082U K 50V |
| C3508 | 403 002 8508 | CERAMIC 0.015U K 25V |
| C3509 | 403 001 8806 | CERAMIC 6800P K 16V |
| C3510 | 403 042 8803 | ELECT 22U M 16V |
| C3511 | 403 042 8803 | ELECT 22U M 16V |
| C3512 | 403 002 8508 | CERAMIC 0.015U K 25V |
| C3513 | 403 063 0008 | POLYESTER 6800P K 50V |
| C3514 | 403 168 6103 | MT-POLYEST 0.1U J 50V |
| OR | 403 067 5603 | MT-COMPO 0.1U J 50V |
| C3515 | 403 001 8806 | CERAMIC 6800P K 16V |
| C3516 | 403 042 8803 | ELECT 22U M 16V |
| C3517 | 403 042 8803 | ELECT 22U M 16V |
| C3518 | 403 115 1601 | CERAMIC 5600P K 16V |
| C3519 | 403 115 1601 | CERAMIC 5600P K 16V |
| C3520 | 403 175 1009 | MT-POLYEST 0.15U J 50V |
| OR | 403 067 6204 | MT-COMPO 0.15U J 50V |
| C3521 | 403 135 4002 | ELECT 47U M 6.3V |
| C3522 | 403 001 1609 | CERAMIC 0.01U K 16V |
| C3523 | 403 109 6308 | ELECT 1U M 50V |
| C3524 | 403 068 9402 | CERAMIC 100P K 50V |
| C3525 | 403 134 4706 | NP-ELECT 2.2U M 50V |
| C3526 | 403 108 0000 | ELECT 0.22U M 50V |
| C3527 | 403 109 6308 | ELECT 1U M 50V |
| C3528 | 403 069 1207 | CERAMIC 1000P K 50V |
| C3529 | 403 001 1609 | CERAMIC 0.01U K 16V |
| C3530 | 403 004 4607 | CERAMIC 0.068U K 25V |
| C3533 | 403 069 1207 | CERAMIC 1000P K 50V |
| C3534 | 403 069 1207 | CERAMIC 1000P K 50V |
| C3535 | 403 135 3708 | ELECT 33U M 6.3V |
| C3536 | 403 001 5003 | CERAMIC 2200P K 16V |
| C3537 | 403 135 7805 | ELECT 3.3U M 50V |
| C3538 | 403 107 9905 | ELECT 10U M 16V |
| C3539 | 403 070 4105 | CERAMIC 120P K 50V |
| C3540 | 403 120 7506 | CERAMIC 220P K 50V |
| D3501 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D3502 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D3503 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D3504 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| D3505 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D3506 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D3507 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| IC351 | 409 180 3700 | IC LC7416-8080 |
| IC352 | 409 178 3507 | IC LA7123 |
| R3501 | 401 013 6308 | CARBON 12K JA 1/4W |
| R3502 | 401 018 4804 | CARBON 33K JA 1/4W |
| R3503 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3504 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3505 | 401 014 4006 | CARBON 1.5K JA 1/4W |
| R3506 | 401 023 7401 | CARBON 9.1K JA 1/4W |
| R3507 | 401 016 4707 | CARBON 22K JA 1/4W |
| R3508 | 401 016 4707 | CARBON 22K JA 1/4W |
| R3509 | 401 012 8006 | CARBON 100K JA 1/4W |
| R3510 | 401 012 8006 | CARBON 100K JA 1/4W |
| R3511 | 401 014 5102 | CARBON 15K JA 1/4W |
| R3512 | 401 014 6000 | CARBON 150K JA 1/4W |
| R3513 | 401 018 5702 | CARBON 330K JA 1/4W |
| R3514 | 401 018 5702 | CARBON 330K JA 1/4W |
| R3515 | 401 018 4804 | CARBON 33K JA 1/4W |
| R3516 | 401 017 3709 | CARBON 270K JA 1/4W |
| R3517 | 401 014 6000 | CARBON 150K JA 1/4W |
| R3518 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3519 | 401 014 6000 | CARBON 150K JA 1/4W |
| R3520 | 401 017 2702 | CARBON 27K JA 1/4W |
| R3521 | 401 018 4804 | CARBON 33K JA 1/4W |
| R3522 | 401 012 9201 | CARBON 1M JA 1/4W |
| R3525 | 401 012 6903 | CARBON 10K JA 1/4W |
| R3526 | 401 016 5704 | CARBON 220K JA 1/4W |
| R3527 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R3528 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R3529 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R3530 | 401 018 7508 | CARBON 360 JA 1/4W |
| R3531 | 401 016 5704 | CARBON 220K JA 1/4W |
| R3532 | 401 020 9200 | CARBON 510K JA 1/4W |
| R3533 | 401 020 7800 | CARBON 510 JA 1/4W |
| R3534 | 401 020 7800 | CARBON 510 JA 1/4W |
| R3536 | 401 020 1907 | CARBON 4.7K JA 1/4W<br>(VHR-8250SP) |
| R3537 | 401 018 5702 | CARBON 330K JA 1/4W |
| VR351 | 613 001 9110 | SEMI VR 220KB |

## POWER SUPPLY CIRCUIT(PW-A)

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| C5402 | 403 135 4002 | ELECT 47U M 6.3V |
| D5403 | 407 053 3109 | ZENER DIODE MTZ12A-T-77 |
| D5404 | 407 078 2705 | DIODE 1SS244-T-77 |
| D5405 | 407 078 1104 | ZENER DIODE MTZ33A-T-77 |
| D5406 | 407 053 2706 | ZENER DIODE MTZ10C-T-77 |
| Q5401 | 405 088 9103 | TR 2SA1703-S-AN |
| Q5402 | 405 089 2103 | TR 2SC4483-S-AN |
| Q5403 | 405 006 7006 | TR 2SA984K-E-AA |
| OR | 405 006 7204 | TR 2SA984K-F-AA |
| Q5404 | 405 006 7006 | TR 2SA984K-E-AA |
| OR | 405 006 7204 | TR 2SA984K-F-AA |
| R5401 | 401 021 8905 | CARBON 6.2K JA 1/4W |
| R5402 | 401 016 3700 | CARBON 2.2K JA 1/4W |
| R5403 | 401 012 5609 | CARBON 1K JA 1/4W |
| R5404 ⚠ | 402 041 6209 | FUSIBLE RES 820 JA 1/4W |
| R5405 | 401 018 3708 | CARBON 3.3K JA 1/4W |
| R5406 | 401 014 5102 | CARBON 15K JA 1/4W |
| R5407 | 401 019 7705 | CARBON 4.3K JA 1/4W |
| R5408 ⚠ | 402 004 1906 | FUSIBLE RES 47 JA 1/4W |
| R5409 | 401 013 6308 | CARBON 12K JA 1/4W |
| R5410 | 401 014 2804 | CARBON 150 JA 1/4W |
| R5411 | 401 014 2804 | CARBON 150 JA 1/4W |

## TUNER CIRCUIT(TN-A)

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| B6001 | 405 018 2501 | TR 2SC3399-AC |
| OR | 405 000 6104 | TR DTC144ES-DCTP |
| B6002 | 405 003 7603 | TR 2SA1345-AC |
| OR | 405 000 2205 | TR DTA144ES-DCTP |
| OR | 405 063 9104 | TR DTA144EL-TL2 |
| B6003 | 405 018 2501 | TR 2SC3399-AC |
| OR | 405 000 6104 | TR DTC144ES-DCTP |
| C6001 | 403 067 5603 | MT-COMPO 0.1U J 50V |
| OR | 403 065 8002 | MT-POLYEST 0.1U J 63V |
| OR | 403 168 6103 | MT-POLYEST 0.1U J 50V |
| C6002 | 403 121 3002 | ELECT 4.7U M 25V |
| C6003 | 403 109 6308 | ELECT 1U M 50V |
| C6004 | 403 067 5603 | MT-COMPO 0.1U J 50V |
| OR | 403 065 8002 | MT-POLYEST 0.1U J 63V |
| OR | 403 168 6103 | MT-POLYEST 0.1U J 50V |
| C6005 | 403 121 3002 | ELECT 4.7U M 25V |
| C6006 | 403 125 5606 | ELECT 100U M 16V |
| C6007 | 403 143 2809 | CERAMIC 0.047U Z 50V |
| C6008 | 403 109 6308 | ELECT 1U M 50V |
| C6009 | 403 135 7409 | ELECT 22U M 50V |
| C6010 | 403 121 9509 | CERAMIC 0.1U Z 50V |
| IC601 | 409 026 8203 | IC L5631 |
| OR | 409 057 5103 | IC UPC574J |
| IC602 | 409 148 5005 | IC M6M80021P |
| OR | 409 199 5306 | IC M6M80011AP |
| Q6001 | 405 027 8709 | TR 2SK68A-K |
| OR | 405 057 9301 | TR 2SK68A-L1 |
| OR | 405 040 0605 | TR 2SK222-C |
| OR | 405 026 9004 | TR 2SK222-D |
| Q6002 | 405 004 4007 | TR 2SA608-E-SPA-AC |
| OR | 405 004 4601 | TR 2SA608-F-SPA-AC |
| OR | 405 006 1707 | TR 2SA933S-TP-Q |
| OR | 405 006 1806 | TR 2SA933S-T93-R |
| OR | 405 093 0508 | TR KSA1175-Y |
| Q6003 | 405 019 2005 | TR 2SC536-E-SPA-AC |
| OR | 405 019 2807 | TR 2SC536-F-SPA-AC |
| OR | 405 093 0607 | TR KSC2785-Y |
| R6001 | 401 018 2701 | CARBON 330 JA 1/4W |
| R6002 | 401 019 0904 | CARBON 390 JA 1/4W |
| R6003 | 401 012 9201 | CARBON 1M JA 1/4W |
| R6004 | 401 019 3905 | CARBON 390K JA 1/4W<br>(VHR-7200G,EX,7100G,EX) |
| OR | 401 012 9201 | CARBON 1M JA 1/4W<br>(VHR-8200SP,8100SP,8250SP) |
| R6005 | 401 020 3802 | CARBON 470K JA 1/4W<br>(VHR-7200G,EX,7100G,EX) |
| OR | 401 021 9902 | CARBON 620K JA 1/4W<br>(VHR-8200SP,8100SP,8250SP) |
| R6006 | 401 019 3905 | CARBON 390K JA 1/4W |
| R6007 | 401 016 8705 | CARBON 240K JA 1/4W<br>(VHR-7200G,EX,7100G,EX) |
| OR | 401 021 4907 | CARBON 560K JA 1/4W<br>(VHR-8200SP,8100SP,8250SP) |
| R6008 | 401 012 5609 | CARBON 1K JA 1/4W |
| R6009 | 401 012 6903 | CARBON 10K JA 1/4W |
| R6010 | 401 012 6903 | CARBON 10K JA 1/4W |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| R6014 | 401 015 9406 | CARBON 2K JA 1/4W<br>(VHR-7200G,7100G) |
| R6015 | 401 012 6903 | CARBON 10K JA 1/4W |

## RF CONVERTER CIRCUIT(CV-A)

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| C6601 | 403 134 8100 | ELECT 100U M 6.3V |
| C6602 | 403 134 8100 | ELECT 100U M 6.3V |
| L6601 | 613 015 6631 | HF CHOKE 15UH K |
| OR | 613 014 8667 | HF CHOKE 15UH K |
| L6602 | 613 015 6631 | HF CHOKE 15UH K |
| OR | 613 014 8667 | HF CHOKE 15UH K |

## COMPL,VD-1

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| COMPL.NO. | 613 108 4186 | (VHR-7200G,EX,7100G,EX) |
| B1701 | 405 029 3504 | TR DTC144EK-T96 |
| OR | 405 018 1900 | TR 2SC3395-TB |
| C1701 | 403 069 5601 | CERAMIC 0.01U K 50V |
| C1702 | 403 009 5807 | CERAMIC 100P J 50V |
| C1703 | 403 189 2405 | ELECT 10U M 16V |
| C1704 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C1705 | 403 189 2405 | ELECT 10U M 16V |
| C1706 | 403 069 5601 | CERAMIC 0.01U K 50V |
| D1701 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| IC171 | 409 003 4907 | IC BA7025L |
| J1701 | 401 037 5004 | MT-GLAZE 0.000 ZA 1/10W |
| Q1701 | 405 014 4400 | TR 2SC2412K-T96-Q |
| OR | 405 014 4509 | TR 2SC2412K-T96-R |
| OR | 405 014 4608 | TR 2SC2412K-T96-S |
| OR | 405 015 8407 | TR 2SC2812-L5-TB |
| OR | 405 015 8704 | TR 2SC2812-L6-TB |
| R1701 | 401 038 0800 | MT-GLAZE 22K JA 1/10W |
| R1702 | 401 037 5608 | MT-GLAZE 10K JA 1/10W |
| R1703 | 401 038 7700 | MT-GLAZE 5.6K JA 1/10W |
| R1704 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R1705 | 401 038 0800 | MT-GLAZE 22K JA 1/10W |
| R1706 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R1707 | 401 038 0701 | MT-GLAZE 2.2K JA 1/10W |
| R1708 | 401 037 8104 | MT-GLAZE 150K JA 1/10W |
| R1709 | 401 038 5805 | MT-GLAZE 430 JA 1/10W |
| R1710 | 401 038 0800 | MT-GLAZE 22K JA 1/10W |
| R1711 | 401 037 5608 | MT-GLAZE 10K JA 1/10W |
| XF171 | 613 084 1681 | FILTER 4.16MHZ B.F |
| XF172 | 613 015 8604 | CHOKE COIL |

## COMPL,VP-1

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| COMPL.NO. | 613 108 8764 | (VHR-7200G,7100G) |
| COMPL.NO. | 613 108 8757 | (EXCEPT VHR-7200G,7100G) |
| C1801 | 403 069 1207 | CERAMIC 1000P K 50V |
| C1802 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1803 | 403 163 7907 | ELECT 47U M 6.3V |
| C1804 | 403 073 6205 | CERAMIC 470P J 50V |
| C1805 | 403 075 3103 | CERAMIC 82P J 50V |
| C1806 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1807 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1808 | 403 003 3304 | CERAMIC 0.022U M 25V |
| C1809 | 403 163 8409 | ELECT 47U M 16V |
| C1810 | 403 001 1906 | CERAMIC 0.01U M 16V |
| C1811 | 403 003 3304 | CERAMIC 0.022U M 25V |
| C1812 | 403 191 8709 | ELECT 1U M 50V |
| C1813 | 403 003 1805 | CERAMIC 2200P M 25V |
| C1814 | 403 003 7104 | CERAMIC 0.033U M 25V |
| C1815 | 403 026 2209 | CERAMIC 47P J 50V |
| C1816 | 403 026 2209 | CERAMIC 47P J 50V |
| C1817 | 403 003 7104 | CERAMIC 0.033U M 25V |
| C1818 | 403 003 1805 | CERAMIC 2200P M 25V |
| IC181 | 409 134 2001 | IC LA7320 |
| L1801 | 613 014 0968 | HF CHOKE 82UH K |
| L1802 | 613 014 0951 | HF CHOKE 68UH K |
| R1801 | 401 013 5202 | CARBON 1.2K JA 1/4W |
| R1802 | 401 015 1509 | CARBON 180 JA 1/4W |
| R1803 | 401 016 2505 | CARBON 220 JA 1/4W |
| R1804 | 401 020 5509 | CARBON 5.1 JA 1/4W |
| VR181 | 613 002 0345 | SEMI VR 1KB |
| VR182 | 613 002 0345 | SEMI VR 1KB |

## COMPL,PW-1

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| COMPL.NO. | 613 108 8771 | (VHR-7200G,7100G) |
| COMPL.NO. | 613 108 4209 | (EXCEPT VHR-7200G,7100G) |
|  | 613 108 7545 | HOLDER,FUSE |
| C5101 | 403 134 5307 | ELECT 1000U M 25V |
| OR | 403 148 0404 | ELECT 1000U M 25V |
| C5102 | 403 110 1705 | ELECT 2200U M 25V |
| OR | 403 148 0701 | ELECT 2200U M 25V |
| C5103 | 403 160 6309 | ELECT 2200U M 16V |
| C5104 | 403 157 0006 | ELECT 47U M 63V |
| C5105 | 403 195 5100 | ELECT 47U M 100V |
| OR | 403 155 5805 | ELECT 47U M 100V |
| C5106 | 403 168 6103 | MT-POLYEST 0.1U J 50V |
| C5107 | 403 135 9403 | ELECT 47U M 35V |
| C5108 | 403 107 9905 | ELECT 10U M 16V |
| C5109 | 403 107 9905 | ELECT 10U M 16V |
| D5101 | 407 004 9600 | DIODE DSF10TC-BT |
| D5102 | 407 004 9600 | DIODE DSF10TC-BT |
| D5103 | 407 132 7400 | DIODE GP30DL-6326 |
| D5104 | 407 132 7400 | DIODE GP30DL-6326 |
| D5105 | 407 004 9709 | DIODE DSK10C-BT |
| OR | 407 088 6502 | DIODE MPG06D-PKG3 |
| OR | 407 005 8701 | DIODE ERA15-02A-V5 |
| D5106 | 407 004 9709 | DIODE DSK10C-BT |
| OR | 407 088 6502 | DIODE MPG06D-PKG3 |
| OR | 407 005 8701 | DIODE ERA15-02A-V5 |
| D5107 | 407 004 9709 | DIODE DSK10C-BT |
| OR | 407 088 6502 | DIODE MPG06D-PKG3 |
| OR | 407 005 8701 | DIODE ERA15-02A-V5 |
| D5108 | 407 004 9709 | DIODE DSK10C-BT |
| OR | 407 088 6502 | DIODE MPG06D-PKG3 |
| OR | 407 005 8701 | DIODE ERA15-02A-V5 |
| D5109 | 407 078 2705 | DIODE 1SS244-T-77 |
| D5110 | 407 078 2705 | DIODE 1SS244-T-77 |
| F5001 ⚠ | 423 004 6708 | FUSE 250V0.315A |
| F5101 ⚠ | 423 004 3004 | FUSE 250V 0.8A |
| F5102 ⚠ | 423 005 4901 | FUSE 250V 1.6A |
| F5103 ⚠ | 423 006 1305 | FUSE 250V 2A |
| F5104 ⚠ | 423 004 6708 | FUSE 250V0.315A |
| L5001 ⚠ | 613 080 0664 | LF CHOKE(VHR-7200G,7100G) |
| OR ⚠ | 613 013 1409 | LF CHOKE(VHR-7200G,7100G) |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| R5101 | 401 007 8301 | CARBON 1.5K JA 1/2W |
| R5102 | 401 007 8301 | CARBON 1.5K JA 1/2W |

## COMPL.PW-2

| | | |
|---|---|---|
| COMPL.NO. | 613 108 4216 | |
| IC521 | 409 214 4208 | IC STK5446 |

## IF PACK

| | | |
|---|---|---|
| COMPL.NO. | 613 107 0547 | (VHR-7200G,EX,7100G,EX) |
| C6103 | 403 021 0200 | CERAMIC 3P C 50V |
| C6104 | 403 021 0200 | CERAMIC 3P C 50V |
| C6105 | 403 006 6203 | CERAMIC 1P C 50V |
| C6106 | 403 006 6203 | CERAMIC 1P C 50V |
| C6107 | 403 071 8102 | CERAMIC 2200P K 50V |
| C6108 | 403 069 1702 | CERAMIC 1000P K 50V |
| C6109 | 403 023 4404 | CERAMIC 330P J 50V |
| C6110 | 403 071 8102 | CERAMIC 2200P K 50V |
| C6113 | 403 075 0706 | CERAMIC 6800P K 50V |
| C6114 | 403 034 1409 | CERAMIC 9P C 50V |
| C6115 | 403 070 9803 | CERAMIC 0.015U K 50V |
| C6116 | 403 049 1005 | ELECT 1U M 50V |
| C6117 | 403 069 1702 | CERAMIC 1000P K 50V |
| C6119 | 403 075 0706 | CERAMIC 6800P K 50V |
| C6120 | 403 053 9707 | ELECT 4.7U M 35V |
| C6121 | 403 075 5305 | CERAMIC 8200P K 50V |
| C6122 | 403 041 9603 | ELECT 10U M 16V |
| C6123 | 403 075 0706 | CERAMIC 6800P K 50V |
| C6124 | 403 069 5601 | CERAMIC 0.01U K 50V |
| C6125 | 403 033 4500 | CERAMIC 82P J 50V |
| C6127 | 403 022 8205 | CERAMIC 33P J 50V |
| C6128 | 403 075 0706 | CERAMIC 6800P K 50V |
| C6129 | 403 043 9700 | ELECT 47U M 16V |
| C6130 | 403 017 0900 | CERAMIC 20P J 50V |
| C6133 | 403 014 3409 | CERAMIC 18P J 50V |
| C6134 | 403 026 2803 | CERAMIC 47P J 50V |
| C6137 | 403 033 4708 | CERAMIC 82P J 50V |
| C6138 | 403 075 0706 | CERAMIC 6800P K 50V |
| C6139 | 403 047 9201 | ELECT 0.1U M 50V |
| C6141 | 403 069 5601 | CERAMIC 0.01U K 50V |
| C6142 | 403 075 0706 | CERAMIC 6800P K 50V |
| C6143 | 403 012 6808 | CERAMIC 15P J 50V |
| IC611 | 409 019 3307 | IC LA7530N |
| L6102 | 613 014 0746 | HF CHOKE 1.2UH M |
| L6103 | 613 098 8393 | COIL,CHOKE 1.2UH |
| L6105 | 613 014 0869 | HF CHOKE 12UH K |
| L6106 | 613 014 0869 | HF CHOKE 12UH K |
| L6107 | 613 014 0869 | HF CHOKE 12UH K |
| L6108 | 613 014 0913 | HF CHOKE 33UH K |
| L6109 | 613 014 0845 | HF CHOKE 8.2UH K |
| Q6101 | 405 015 5505 | TR 2SC2757-T1B-T33 |
| Q6102 | 405 002 0209 | TR 2SA1037K-Q |
| Q6103 | 405 021 2406 | TR 2SD1048-X7-TB |
| R6101 | 401 037 7206 | MT-GLAZE 130 JA 1/10W |
| R6102 | 401 014 2804 | CARBON 150 JA 1/4W |
| R6103 | 401 038 0602 | MT-GLAZE 220 JA 1/10W |
| R6104 | 401 037 7800 | MT-GLAZE 150 JA 1/10W |
| R6105 | 401 039 0205 | MT-GLAZE 82 JA 1/10W |
| R6106 | 401 038 9704 | MT-GLAZE 7.5K JA 1/10W |
| R6107 | 401 037 7909 | MT-GLAZE 1.5K JA 1/10W |
| R6108 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6109 | 401 038 0503 | MT-GLAZE 22 JA 1/10W |
| R6110 | 401 037 7909 | MT-GLAZE 1.5K JA 1/10W |
| R6111 | 401 038 6307 | MT-GLAZE 470 JA 1/10W |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| R6112 | 401 038 2002 | MT-GLAZE 270 JA 1/10W |
| R6113 | 401 038 0701 | MT-GLAZE 2.2K JA 1/10W |
| R6114 | 401 038 7205 | MT-GLAZE 5.1K JA 1/10W |
| R6115 | 401 037 9200 | MT-GLAZE 1.8K JA 1/10W |
| R6116 | 401 038 0800 | MT-GLAZE 22K JA 1/10W |
| R6117 | 401 012 5609 | CARBON 1K JA 1/4W |
| R6118 | 401 038 4105 | MT-GLAZE 3.6K JA 1/10W |
| R6119 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6120 | 401 037 7305 | MT-GLAZE 1.3K JA 1/10W |
| R6121 | 401 038 2002 | MT-GLAZE 270 JA 1/10W |
| R6124 | 401 038 6406 | MT-GLAZE 4.7K JA 1/10W |
| R6126 | 401 037 7800 | MT-GLAZE 150 JA 1/10W |
| R6128 | 401 037 5202 | MT-GLAZE 100 JA 1/10W |
| R6129 | 401 038 3603 | MT-GLAZE 3.3K JA 1/10W |
| R6130 | 401 037 5202 | MT-GLAZE 100 JA 1/10W |
| R6132 | 401 037 7503 | MT-GLAZE 130K JA 1/10W |
| R6133 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6134 | 401 012 6903 | CARBON 10K JA 1/4W |
| R6135 | 401 037 8104 | MT-GLAZE 150K JA 1/10W |
| R6136 | 401 038 0008 | MT-GLAZE 200 JA 1/10W |
| R6137 | 401 037 7800 | MT-GLAZE 150 JA 1/10W |
| R6138 | 401 037 7800 | MT-GLAZE 150 JA 1/10W |
| T6101 | 613 098 8355 | TRANS,IF |
| T6102 | 613 098 8362 | TRANS,IF |
| T6103 | 613 098 8379 | TRANS,IF |
| T6104 | 613 098 8386 | TRANS,IF |
| VR611 | 613 001 9035 | SEMI VR 10KB |
| XF611 | 421 002 9509 | SAW F TSF1338L |
| XF612 | 613 084 1728 | FILTER |
| XF613 | 613 110 1050 | FILTER |
| XF614 | 613 084 1674 | FILTER |
| XF615 | 613 098 8317 | DISCR,CERAMIC 5.74M |

## IF PACK

| | | |
|---|---|---|
| COMPL.NO. | 613 094 4436 | (VHR-8200SP,8100SP,8250SP) |
| C6102 | 403 028 4409 | CERAMIC 56P J 50V |
| C6104 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6105 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6107 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6108 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6111 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C6112 | 403 069 1702 | CERAMIC 1000P K 50V |
| C6113 | 403 050 0509 | ELECT 2.2U M 50V |
| C6114 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6116 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6117 | 403 048 4809 | ELECT 0.33U M 50V |
| C6118 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6119 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6120 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C6124 | 403 042 3006 | ELECT 100U M 16V |
| C6131 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| C6136 | 403 014 3409 | CERAMIC 18P J 50V |
| C6137 | 403 009 5708 | CERAMIC 100P J 50V |
| C6138 | 403 048 6902 | ELECT 0.47U M 50V |
| C6139 | 403 022 8403 | CERAMIC 33P J 50V |
| C6140 | 403 049 0800 | ELECT 1U M 50V |
| C6141 | 403 145 3408 | CERAMIC 10P J 50V |
| C6142 | 403 070 9803 | CERAMIC 0.015U K 50V |
| C6144 | 403 047 0604 | ELECT 4.7U M 25V |
| C6145 | 403 030 7207 | CERAMIC 68P J 50V |
| C6153 | 403 024 2102 | CERAMIC 39P J 50V |
| C6155 | 403 069 9500 | CERAMIC 0.01U Z 50V |
| D6101 | 407 053 8906 | ZENER DIODE MTZ9.1C-T-77 |
| D6102 | 407 103 5305 | DIODE 1SS318-TT51 |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| IC611 | 409 036 0105 | IC M51366SP |
| J6107 | 401 035 4108 | MT-GLAZE 0.000 ZA 1/8W |
| J6109 | 401 037 5004 | MT-GLAZE 0.000 ZA 1/10W |
| J6112 | 401 037 5004 | MT-GLAZE 0.000 ZA 1/10W |
| J6113 | 401 037 5004 | MT-GLAZE 0.000 ZA 1/10W |
| J6114 | 401 037 5004 | MT-GLAZE 0.000 ZA 1/10W |
| J6115 | 401 037 5004 | MT-GLAZE 0.000 ZA 1/10W |
| L6108 | 613 014 0845 | HF CHOKE 8.2UH K |
| L6110 | 613 098 6054 | COIL,CHOKE 1.8UH |
| Q6101 | 405 090 3304 | TR 2SC3838K-ADP-T96 |
| Q6102 | 405 004 3901 | TR 2SA608-E-NP |
| Q6103 | 405 015 8407 | TR 2SC2812-L5-TB |
| Q6106 | 405 015 8407 | TR 2SC2812-L5-TB |
| R6101 | 402 023 4506 | FUSIBLE RES 27 JA 1/2W |
| R6103 | 401 038 7700 | MT-GLAZE 5.6K JA 1/10W |
| R6104 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6105 | 401 038 4907 | MT-GLAZE 39 JA 1/10W |
| R6106 | 401 035 4603 | MT-GLAZE 100 JA 1/8W |
| R6107 | 401 038 0602 | MT-GLAZE 220 JA 1/10W |
| R6109 | 401 038 3603 | MT-GLAZE 3.3K JA 1/10W |
| R6110 | 401 038 3801 | MT-GLAZE 330K JA 1/10W |
| R6111 | 401 037 9309 | MT-GLAZE 18K JA 1/10W |
| R6112 | 401 038 3801 | MT-GLAZE 330K JA 1/10W |
| R6113 | 401 038 7809 | MT-GLAZE 56K JA 1/10W |
| R6114 | 401 038 9209 | MT-GLAZE 6.8K JA 1/10W |
| R6115 | 401 038 5102 | MT-GLAZE 3.9K JA 1/10W |
| R6116 | 401 038 7700 | MT-GLAZE 5.6K JA 1/10W |
| R6117 | 401 038 0701 | MT-GLAZE 2.2K JA 1/10W |
| R6118 | 401 037 9200 | MT-GLAZE 1.8K JA 1/10W |
| R6119 | 401 038 2101 | MT-GLAZE 2.7K JA 1/10W |
| R6120 | 401 037 7909 | MT-GLAZE 1.5K JA 1/10W |
| R6121 | 401 039 0601 | MT-GLAZE 820K JA 1/10W |
| R6122 | 401 038 3603 | MT-GLAZE 3.3K JA 1/10W |
| R6123 | 401 037 5608 | MT-GLAZE 10K JA 1/10W |
| R6124 | 401 039 0403 | MT-GLAZE 8.2K JA 1/10W |
| R6125 | 401 038 3504 | MT-GLAZE 330 JA 1/10W |
| R6126 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6127 | 401 036 8105 | MT-GLAZE 470 JA 1/8W |
| R6128 | 401 038 8905 | MT-GLAZE 68 JA 1/10W |
| R6129 | 401 037 5202 | MT-GLAZE 100 JA 1/10W |
| R6130 | 401 038 3702 | MT-GLAZE 33K JA 1/10W |
| R6136 | 401 038 6307 | MT-GLAZE 470 JA 1/10W |
| R6137 | 401 038 7205 | MT-GLAZE 5.1K JA 1/10W |
| R6138 | 401 038 6208 | MT-GLAZE 47 JA 1/10W |
| R6145 | 401 039 0304 | MT-GLAZE 820 JA 1/10W |
| R6146 | 401 038 6208 | MT-GLAZE 47 JA 1/10W |
| R6147 | 401 038 6505 | MT-GLAZE 47K JA 1/10W |
| R6148 | 401 039 0304 | MT-GLAZE 820 JA 1/10W |
| R6149 | 401 037 9101 | MT-GLAZE 180 JA 1/10W |
| R6151 | 401 038 2002 | MT-GLAZE 270 JA 1/10W |
| R6152 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6153 | 401 038 5003 | MT-GLAZE 390 JA 1/10W |
| R6154 | 401 038 6406 | MT-GLAZE 4.7K JA 1/10W |
| R6155 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6157 | 401 037 0108 | MT-GLAZE 5.6K JA 1/8W |
| R6159 | 401 038 0800 | MT-GLAZE 22K JA 1/10W |
| R6160 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| VR611 | 613 002 1137 | SEMI VR 1K |
| X6101 | 421 002 2500 | SAW F TSF1319L |
| X6105 | 613 088 8372 | FILTER,5.85M |
| X6106 | 613 091 7652 | FILTER,5.5MHZ |
| X6111 | 613 086 1191 | DISCR,CERAMIC |
| X6113 | 613 084 1704 | FILTER |

**COMPL,TN-7**

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| COMPL.NO. | 613 109 1030 | |
| B6901 | 405 018 1900 | TR 2SC3395-TB |
| OR | 405 029 3504 | TR DTC144EK-T96 |
| C6901 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C6902 | 403 189 2405 | ELECT 10U M 16V |
| C6903 | 403 072 3403 | CERAMIC 0.022U Z 50V |
| C6904 | 403 193 8400 | ELECT 0.22U M 50V |
| C6921 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C6922 | 403 014 9203 | CERAMIC 180P J 50V |
| C6923 | 403 069 1702 | CERAMIC 1000P K 50V |
| C6924 | 403 067 7300 | MT-COMPO 0.33U J 50V |
| OR | 403 115 1007 | MT-POLYEST 0.33U J 63V |
| OR | 403 168 6202 | MT-POLYEST 0.33U J 50V |
| C6925 | 403 067 6709 | MT-COMPO 0.22U J 50V |
| OR | 403 065 8101 | MT-POLYEST 0.22U J 63V |
| OR | 403 184 9805 | MT-POLYEST 0.22U J 50V |
| D6901 | 407 004 0706 | DIODE DCB015-TB |
| OR | 407 003 3609 | DIODE DAN202K-T-96 |
| D6902 | 407 003 5108 | DIODE DA204K-T96 |
| IC691 | 409 019 6209 | IC LA7910 |
| J6901 | 401 037 5004 | MT-GLAZE 0.000 ZA 1/10W |
| Q6901 | 405 015 8308 | TR 2SC2812-L4-TB |
| OR | 405 015 8407 | TR 2SC2812-L5-TB |
| OR | 405 014 4400 | TR 2SC2412K-T96-Q |
| OR | 405 014 4509 | TR 2SC2412K-T96-R |
| Q6902 | 405 030 7201 | TR 2SA1338-4-TB |
| OR | 405 030 7300 | TR 2SA1338-5-TB |
| Q6903 | 405 015 8308 | TR 2SC2812-L4-TB |
| OR | 405 015 8407 | TR 2SC2812-L5-TB |
| OR | 405 014 4400 | TR 2SC2412K-T96-Q |
| OR | 405 014 4509 | TR 2SC2412K-T96-R |
| Q6921 | 405 084 8209 | TR 2SC2960-F-SPA-AC |
| OR | 405 084 8308 | TR 2SC2960-G-SPA-AC |
| R6901 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6902 | 401 038 3504 | MT-GLAZE 330 JA 1/10W |
| R6903 | 401 038 8509 | MT-GLAZE 620 JA 1/10W |
| R6904 | 401 037 5608 | MT-GLAZE 10K JA 1/10W |
| R6905 | 401 038 3801 | MT-GLAZE 330K JA 1/10W |
| R6906 | 401 037 5608 | MT-GLAZE 10K JA 1/10W |
| R6907 | 401 038 3603 | MT-GLAZE 3.3K JA 1/10W |
| R6908 | 401 039 0205 | MT-GLAZE 82 JA 1/10W |
| R6909 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R6910 | 401 038 7106 | MT-GLAZE 510 JA 1/10W |
| R6911 | 401 038 7700 | MT-GLAZE 5.6K JA 1/10W |
| R6912 | 401 038 5102 | MT-GLAZE 3.9K JA 1/10W |
| R6921 | 401 038 5102 | MT-GLAZE 3.9K JA 1/10W |
| R6922 | 401 038 3702 | MT-GLAZE 33K JA 1/10W |
| R6923 | 401 037 5608 | MT-GLAZE 10K JA 1/10W |
| R6924 | 401 037 5608 | MT-GLAZE 10K JA 1/10W |
| R6925 | 401 037 9309 | MT-GLAZE 18K JA 1/10W |
| R6926 | 401 037 8005 | MT-GLAZE 15K JA 1/10W |
| R6927 | 401 037 6803 | MT-GLAZE 12K JA 1/10W |
| T6901 | 613 109 0958 | TRANS,IF |
| OR | 613 109 0965 | TRANS,IF |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| **COMPL,TM-1** | | |
| COMPL.NO. | 613 108 9730 | (EXCEPT VHR-8250SP) |
| COMPL.NO. | 613 111 5446 | (VHR-8250SP) |
| | 613 022 0875 | HOLDER |
| A7101 | 613 084 3197 | FLUORESCENT TUBE |
| C7102 | 403 014 2501 | CERAMIC 18P J 50V |
| C7103 | 403 017 0108 | CERAMIC 20P J 50V |
| C7104 | 403 001 1609 | CERAMIC 0.01U K 16V |
| C7105 | 403 139 1601 | ELECT 22U M 16V |
| C7106 | 403 001 1609 | CERAMIC 0.01U K 16V |
| C7107 | 403 001 1609 | CERAMIC 0.01U K 16V |
| C7108 | 403 139 2608 | ELECT 0.47U M 50V |
| C7111 | 403 121 9509 | CERAMIC 0.1U Z 50V |
| C7113 | 403 139 1502 | ELECT 10U M 16V |
| D7101 | 407 120 5807 | DIODE AK04-V2 |
| D7103 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D7104 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D7105 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D7106 | 407 007 9904 | DIODE GMA01-BT(VHR-8250SP) |
| OR | 407 012 4406 | DIODE 1SS133-T-77(VHR-8250SP) |
| D7107 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D7108 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D7110 | 407 007 9904 | DIODE GMA01-BT |
| OR | 407 012 4406 | DIODE 1SS133-T-77 |
| D7123 | 407 007 9904 | DIODE GMA01-BT(VHR-8250SP) |
| OR | 407 012 4406 | DIODE 1SS133-T-77(VHR-8250SP) |
| IC711 | 409 216 2905 | IC M50958-294SP |
| IC712 | 409 032 3308 | IC MN1280-L |
| R7101 | 401 012 9201 | CARBON 1M JA 1/4W |
| R7102 | 401 110 6201 | CARBON 10M JA 1/4W |
| R7103 | 401 018 5702 | CARBON 330K JA 1/4W |
| R7104 | 401 012 5609 | CARBON 1K JA 1/4W |
| R7105 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7106 | 401 012 5609 | CARBON 1K JA 1/4W |
| R7107 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7108 | 401 012 5609 | CARBON 1K JA 1/4W |
| R7109 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7110 | 401 012 5609 | CARBON 1K JA 1/4W |
| R7111 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7112 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7114 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7115 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7116 | 401 016 4707 | CARBON 22K JA 1/4W |
| R7117 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7118 | 401 012 5609 | CARBON 1K JA 1/4W |
| R7119 | 401 012 5609 | CARBON 1K JA 1/4W |
| R7121 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7122 | 401 012 5609 | CARBON 1K JA 1/4W |
| R7123 | 401 012 5609 | CARBON 1K JA 1/4W |
| R7124 | 401 018 4804 | CARBON 33K JA 1/4W |
| R7126 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7127 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7132 | 401 012 6903 | CARBON 10K JA 1/4W |
| R7133 | 401 018 5702 | CARBON 330K JA 1/4W |
| RR711 | 613 094 0421 | IR RECEIVER PACK |
| S7101 | 613 006 3649 | PUSH SWITCH |
| OR | 613 079 4130 | SW,PUSH |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| S7101 | 613 092 1734 | SW,PUSH |
| OR | 613 092 0751 | SW,PUSH |
| S7102 | 613 006 3649 | PUSH SWITCH |
| OR | 613 079 4130 | SW,PUSH |
| OR | 613 092 1734 | SW,PUSH |
| OR | 613 092 0751 | SW,PUSH |
| S7103 | 613 006 3649 | PUSH SWITCH |
| OR | 613 079 4130 | SW,PUSH |
| OR | 613 092 1734 | SW,PUSH |
| OR | 613 092 0751 | SW,PUSH |
| S7104 | 613 006 3700 | SW,PUSH(VHR-8250SP) |
| OR | 613 079 4178 | SW,PUSH(VHR-8250SP) |
| OR | 613 093 8596 | SW,PUSH(VHR-8250SP) |
| OR | 613 093 8602 | SW,PUSH(VHR-8250SP) |
| S7106 | 613 006 3700 | PUSH SWITCH |
| OR | 613 079 4178 | SW,PUSH |
| OR | 613 093 8596 | SW,PUSH |
| OR | 613 093 8602 | SW,PUSH |
| S7108 | 613 006 3700 | PUSH SWITCH |
| OR | 613 079 4178 | SW,PUSH |
| OR | 613 093 8596 | SW,PUSH |
| OR | 613 093 8602 | SW,PUSH |
| S7113 | 613 006 3649 | PUSH SWITCH |
| OR | 613 079 4130 | SW,PUSH |
| OR | 613 092 1734 | SW,PUSH |
| OR | 613 092 0751 | SW,PUSH |
| S7118 | 613 006 3700 | PUSH SWITCH |
| OR | 613 079 4178 | SW,PUSH |
| OR | 613 093 8596 | SW,PUSH |
| OR | 613 093 8602 | SW,PUSH |
| S7120 | 613 006 3700 | PUSH SWITCH |
| OR | 613 079 4178 | SW,PUSH |
| OR | 613 093 8596 | SW,PUSH |
| OR | 613 093 8602 | SW,PUSH |
| S7125 | 613 006 3649 | PUSH SWITCH |
| OR | 613 079 4130 | SW,PUSH |
| OR | 613 092 1734 | SW,PUSH |
| OR | 613 092 0751 | SW,PUSH |
| S7126 | 613 006 3649 | PUSH SWITCH |
| OR | 613 079 4130 | SW,PUSH |
| OR | 613 092 1734 | SW,PUSH |
| OR | 613 092 0751 | SW,PUSH |
| S7129 | 613 006 3700 | PUSH SWITCH |
| OR | 613 079 4178 | SW,PUSH |
| OR | 613 093 8596 | SW,PUSH |
| OR | 613 093 8602 | SW,PUSH |
| S7130 | 613 006 3700 | PUSH SWITCH |
| OR | 613 079 4178 | SW,PUSH |
| OR | 613 093 8596 | SW,PUSH |
| OR | 613 093 8602 | SW,PUSH |
| S7137 | 613 006 3700 | PUSH SWITCH |
| OR | 613 079 4178 | SW,PUSH |
| OR | 613 093 8596 | SW,PUSH |
| OR | 613 093 8602 | SW,PUSH |
| X7101 | 613 089 4069 | RESONATOR,CERAMIC 6MHZ |
| OR | 613 108 9570 | RESONATOR,CERAMIC 6MHZ |
| X7102 | 613 109 0972 | OSC,CRYSTAL 32KHZ |
| **COMPL,TM-2** | | |
| COMPL.NO. | 613 108 9761 | |
| S7114 | 613 006 3649 | PUSH SWITCH |
| OR | 613 079 4130 | SW,PUSH |
| OR | 613 092 1734 | SW,PUSH |
| OR | 613 092 0751 | SW,PUSH |
| S7115 | 613 006 3649 | PUSH SWITCH |
| OR | 613 079 4130 | SW,PUSH |
| OR | 613 092 1734 | SW,PUSH |
| OR | 613 092 0751 | SW,PUSH |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| VR771 | 613 079 2495 | VR,ROTARY 10KB |

**COMPL,TM-8**

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| COMPL.NO. | 613 108 5534 | (VHR-7200G,7100G) |
| C7802 | 403 013 3103 | CERAMIC 150P J 50V |
| C7803 | 403 067 7300 | MT-COMPO 0.33U J 50V |
| OR | 403 115 1007 | MT-POLYEST 0.33U J 63V |
| OR | 403 168 6202 | MT-POLYEST 0.33U J 50V |
| C7804 | 403 057 2407 | POLYESTER 0.1U J 50V |
| C7805 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C7806 | 403 193 7502 | ELECT 22U M 6.3V |
| IC781 | 409 148 5104 | IC SDA5642 |
| Q7801 | 405 015 8407 | TR 2SC2812-L5-TB |
| OR | 405 015 8704 | TR 2SC2812-L6-TB |
| OR | 405 014 4400 | TR 2SC2412K-T96-Q |
| OR | 405 014 4509 | TR 2SC2412K-T96-R |
| R7801 | 401 038 6307 | MT-GLAZE 470 JA 1/10W |
| R7802 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R7803 | 401 037 5400 | MT-GLAZE 1K JA 1/10W |
| R7804 | 401 037 9101 | MT-GLAZE 180 JA 1/10W |
| R7805 | 401 038 0701 | MT-GLAZE 2.2K JA 1/10W |
| R7806 | 401 037 5806 | MT-GLAZE 1M JA 1/10W |
| R7807 | 401 039 0601 | MT-GLAZE 820K JA 1/10W |
| R7808 | 401 037 5707 | MT-GLAZE 100K JA 1/10W |
| R7809 | 401 037 5608 | MT-GLAZE 10K JA 1/10W |
| R7810 | 401 037 7008 | MT-GLAZE 1.2M JA 1/10W |
| R7811 | 401 037 5202 | MT-GLAZE 100 JA 1/10W |
| R7812 | 401 038 7700 | MT-GLAZE 5.6K JA 1/10W |

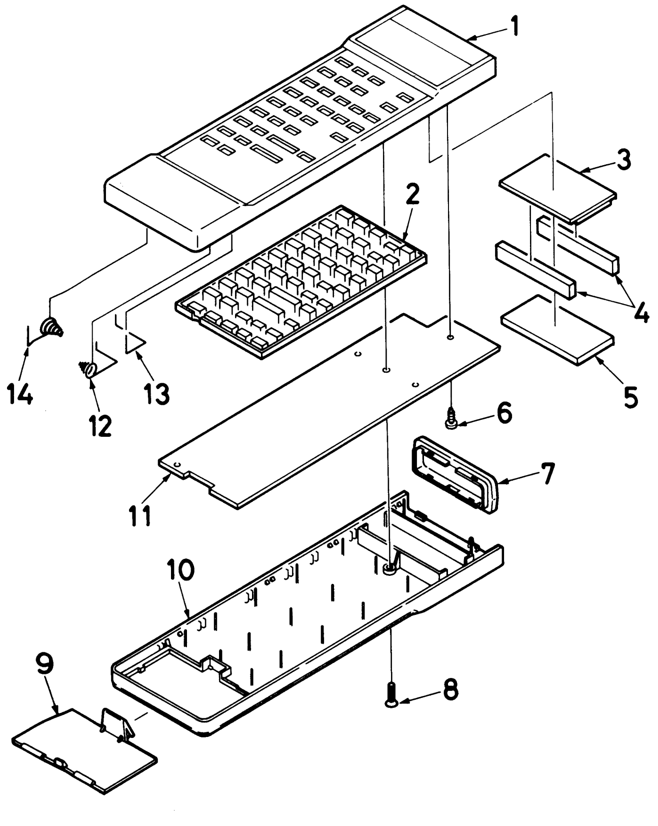
**ACCESSORIES**

| | | |
|---|---|---|
| | 613 108 4315 | REMOCON(VHR-7200G) |
| OR | 613 110 0824 | REMOCON(VHR-7100G) |
| OR | 613 108 4322 | REMOCON(VHR-7200EX,8200SP) |
| OR | 613 109 3751 | REMOCON(VHR-7100EX,8100SP) |
| OR | 613 113 5949 | REMOCON(VHR-8250SP) |
| | 613 109 2099 | INSTRUCTION MANUAL(VHR-7200G,EX) |
| OR | 613 111 5651 | INSTRUCTION MANUAL(VHR-7100G) |
| OR | 613 110 3047 | INSTRUCTION MANUAL(VHR-7100EX) |
| OR | 613 109 3546 | INSTRUCTION MANUAL(VHR-8200SP) |
| OR | 613 109 3553 | INSTRUCTION MANUAL(VHR-8100SP) |
| OR | 613 111 6313 | INSTRUCTION MANUAL(VHR-8250SP) |
| | 613 112 8187 | CAUTION SHEET |
| | 613 096 6773 | CABLE,ANT |
| | 613 064 7047 | GUARANTEE CARD(VHR-8200SP,8250SP) |

**PACKING MATERIALS**

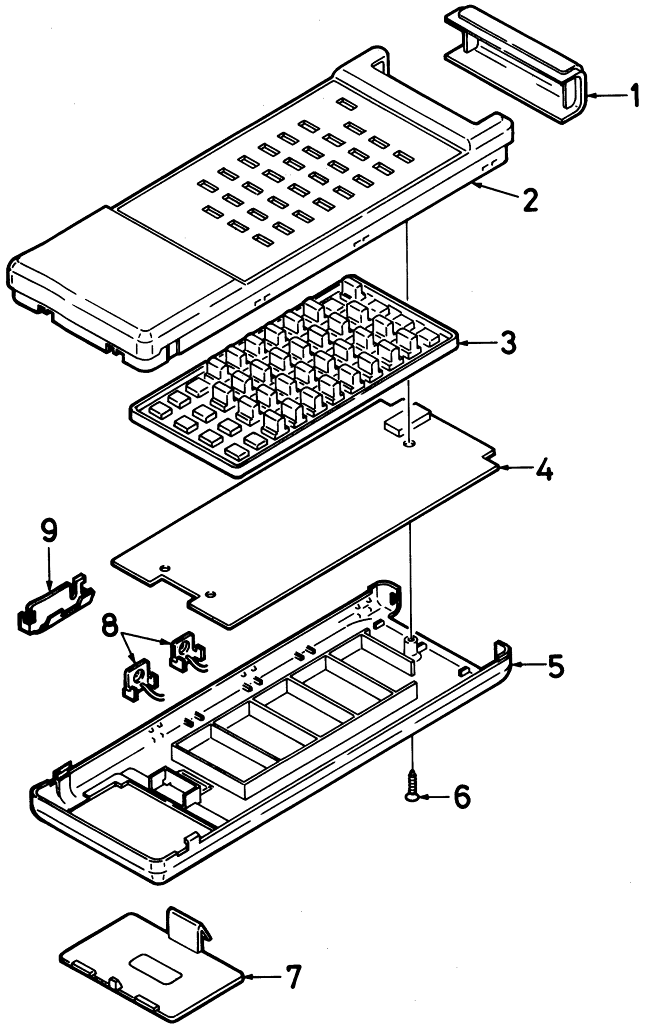
| | | |
|---|---|---|
| | 613 109 2044 | CORR CASE,INNER(VHR-7200G) |
| OR | 613 110 8554 | CORR CASE,INNER(VHR-7100G) |
| OR | 613 109 2051 | CORR CASE,INNER(VHR-7200EX) |
| OR | 613 110 2972 | CORR CASE,INNER(VHR-7100EX) |
| OR | 613 109 3515 | CORR CASE,INNER(VHR-8200SP) |
| OR | 613 109 3522 | CORR CASE,INNER(VHR-8100SP) |
| OR | 613 111 6221 | CORR CASE,INNER(VHR-8250SP) |
| | 613 093 7803 | CUSHION,INNER,FRONT |
| | 613 093 7810 | CUSHION,INNER,BACK |
| | 613 095 1229 | POLYE COVER,INNER |
| | 613 107 8970 | BAR CODE LABEL |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| **REMOCON** | | |
| COMPL.NO. | 613 108 4315 | (VHR-7200G) |
| COMPL.NO. | 613 108 4322 | (VHR-7200EX,8200SP) |
| COMPL.NO. | 613 113 5949 | (VHR-8250SP) |
| 1 | 613 110 1166 | ASSY,CABINET,TOP(VHR-7200G) |
| OR | 613 110 1173 | ASSY,CABINET,TOP(VHR-7200EX,8200SP) |
| OR | 613 113 9664 | ASSY,CABINET,TOP(VHR-8250SP) |
| 2 | 613 110 1005 | BUTTON(VHR-7200G) |
| OR | 613 110 1012 | BUTTON(VHR-7200EX,8200SP) |
| OR | 613 113 9275 | BUTTON(VHR-8250SP) |
| 3 | 613 087 0087 | LCD |
| 4 | 613 080 9520 | CONNECTOR |
| 5 | 613 080 9728 | SPACER |
| 6 | 411 022 7807 | SCR S-TPG PAN 2X6 |
| 7 | 613 080 9681 | SIGN WINDOW |
| 8 | 411 101 7308 | SCR S-TPG FLT 2.6X10 |
| 9 | 613 040 1724 | BATTERY LID |
| 10 | 613 040 0727 | BOTTOM LID |
| 11 | 613 110 1128 | COMPL.RM-1 |
| 12 | 613 080 9759 | TERMINAL,-(INCLUDE RM-1) |
| 13 | 613 080 9742 | TERMINAL,+(INCLUDE RM-1) |
| 14 | 613 080 9735 | TERMINAL |



| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| **COMPL.RM-1** | | |
| COMPL.NO. | 613 110 1128 | (VHR-7200G,EX,8200SP,8250SP) |
| C1 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C2 | 403 049 0800 | ELECT 1U M 50V |
| C3 | 613 087 2043 | CAP,TRIM 20P |
| C4 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C5 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C6 | 403 068 0409 | CERAMIC 0.1U Z 25V |
| C7 | 403 038 1603 | ELECT 100U M 6.3V |
| IC1 | 409 218 2309 | IC LC5863H-1120 |
| IC2 | 409 129 3402 | IC UPD74HC08G |
| OR | 409 208 1909 | IC MLC74HC08AM |
| OR | 409 221 3102 | IC MC74HC08AF |
| LED1 | 407 040 3709 | LED SLR-932A |
| Q1 | 405 021 2406 | TR 2SD1048-X7-TB |
| OR | 405 021 2505 | TR 2SD1048-X8-TB |
| R1 | 401 037 5202 | MT-GLAZE 100 JA 1/10W |
| R2 | 401 015 6405 | CARBON 2.2 JA 1/4W |
| R3 | 401 037 5202 | MT-GLAZE 100 JA 1/10W |
| R5 | 401 039 0601 | MT-GLAZE 820K JA 1/10W |
| X1 | 613 082 8156 | OSC,CRYSTAL 38.2293KHZ |

| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| **REMOCON** | | |
| COMPL.NO. | 613 110 0824 | (VHR-7100G) |
| COMPL.NO. | 613 109 3751 | (VHR-7100EX,8100SP) |
| 1 | 613 040 5395 | SIGN,WINDOW |
| 2 | 613 111 0045 | ASSY,CABINET,TOP(VHR-7100G) |
| OR | 613 110 1180 | ASSY,CABINET,TOP(VHR-7100EX,8100SP) |
| 3 | 613 110 8844 | BUTTON |
| 4 | 613 110 9544 | COMPL,RM-1 |
| 5 | 613 040 0703 | BOTTOM LID |
| 6 | 411 101 7506 | SCR S-TPG FLT 2.6X12 |
| 7 | 613 040 1663 | BATTERY LID |
| 8 | 613 052 5390 | TERMINAL(INCLUDE RM-1) |
| 9 | 613 052 5383 | TERMINAL |



| LOCATION | PARTS NO. | DESCRIPTION |
|---|---|---|
| **COMPL,RM-1** | | |
| COMPL.NO. | 613 110 9544 | (VHR-7100G,EX,8100SP) |
| C1 | 403 009 3100 | CERAMIC 100P J 50V |
| C2 | 403 009 3100 | CERAMIC 100P J 50V |
| C3 | 403 039 2104 | ELECT 47U M 6.3V |
| C4 | 403 001 2903 | CERAMIC 0.1U M 16V |
| IC1 | 409 220 8108 | IC UPD6124G-797 |
| LED1 | 407 040 3709 | LED SLR-932A |
| Q1 | 405 066 7305 | TR 2SC4040-R |
| OR | 405 015 3006 | TR 2SC2673-R |
| OR | 405 015 3105 | TR 2SC2673-S |
| R1 | 401 015 6405 | CARBON 2.2 JA 1/4W |
| X1 | 613 016 6913 | CERAMIC RESONATOR CSB455EB |
| OR | 613 016 6920 | CERAMIC RESONATOR KBR455BT |

# BLOCK DIAGRAMS, CIRCUIT DIAGRAMS & PRINTED CIRCUIT BOARDS

| | | |
|---|---|---|
| VHR-7200G | VHR-7100G | West Germany |
| VHR-7200EX | VHR-7100EX | Switzerland |
| VHR-8200SP | VHR-8100SP | Europe |
| VHR-8250SP | | Spain |

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**RP1/G, G-2, EX, EX2, SP, SP2, RP1L/SP 03H**

**REFERENCE NO. WM-530607**

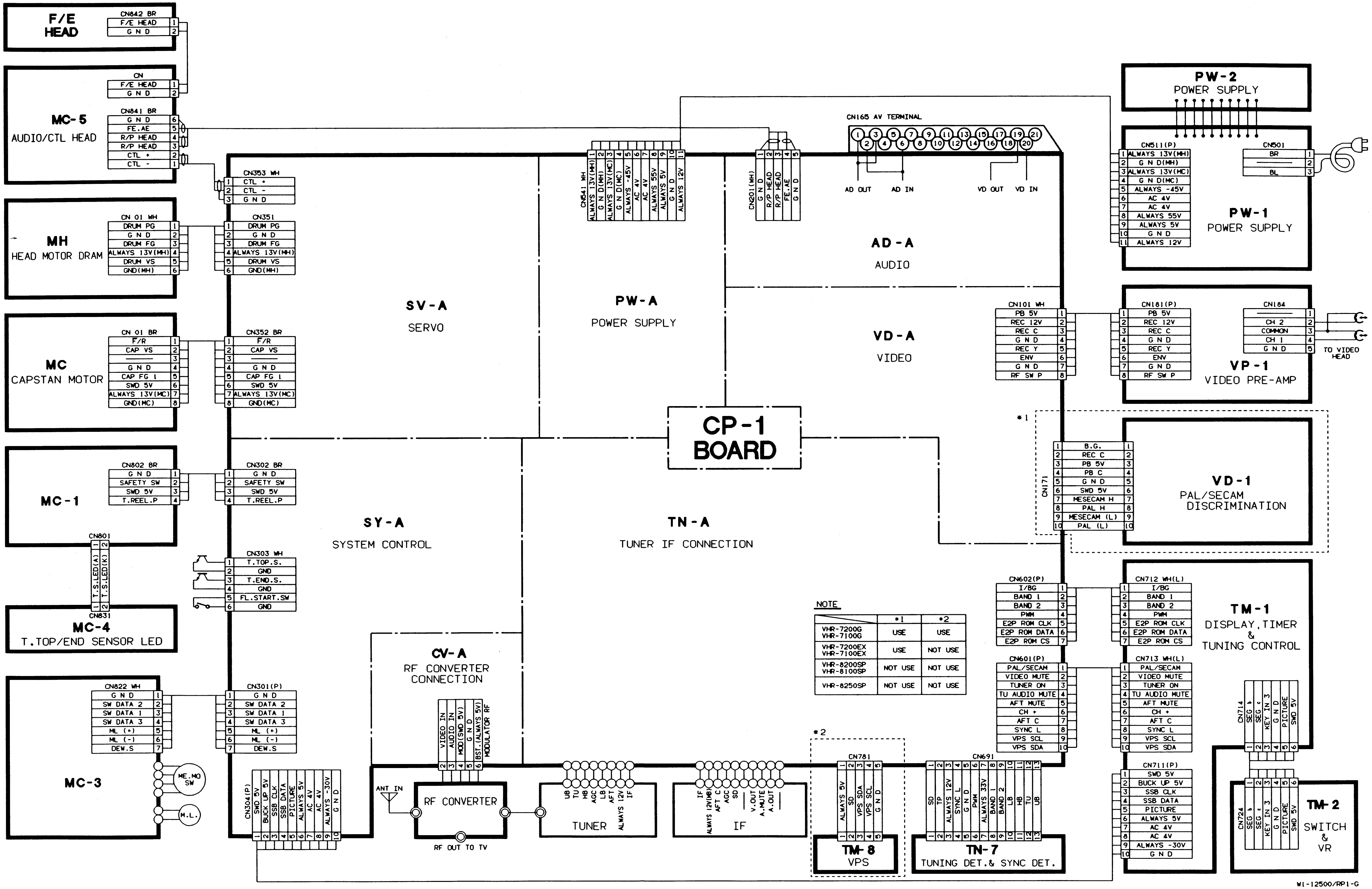
**NOTES:**

1. All resistance values in "OHMS" unless otherwise noted. (K = 1,000 M = 1,000,000)
2. All capacitance values in "$\mu$fd" unless otherwise noted. p = pico farad
3. All inductance values in "mH" unless otherwise noted. $\mu$ = micro henry

**PRODUCT SAFETY NOTICE**

**THE COMPONENTS DESIGNATED BY A SYMBOL ( ⚠ ) IN THIS SCHEMATIC DIAGRAM DESIGNATES COMPONENTS WHOSE VALUE ARE OF SPECIAL SIGNIFICANCE TO PRODUCT SAFETY. SHOULD ANY COMPONENT DESIGNATED BY A SIMBOL NEED TO BE REPLACED, USE ONLY THE PART DESIGNATED IN THE PARTS LIST. DO NOT DEVIATE FROM THE RESISTANCE, WATTAGE AND VOLTAGE RATINGS SHOWN.**

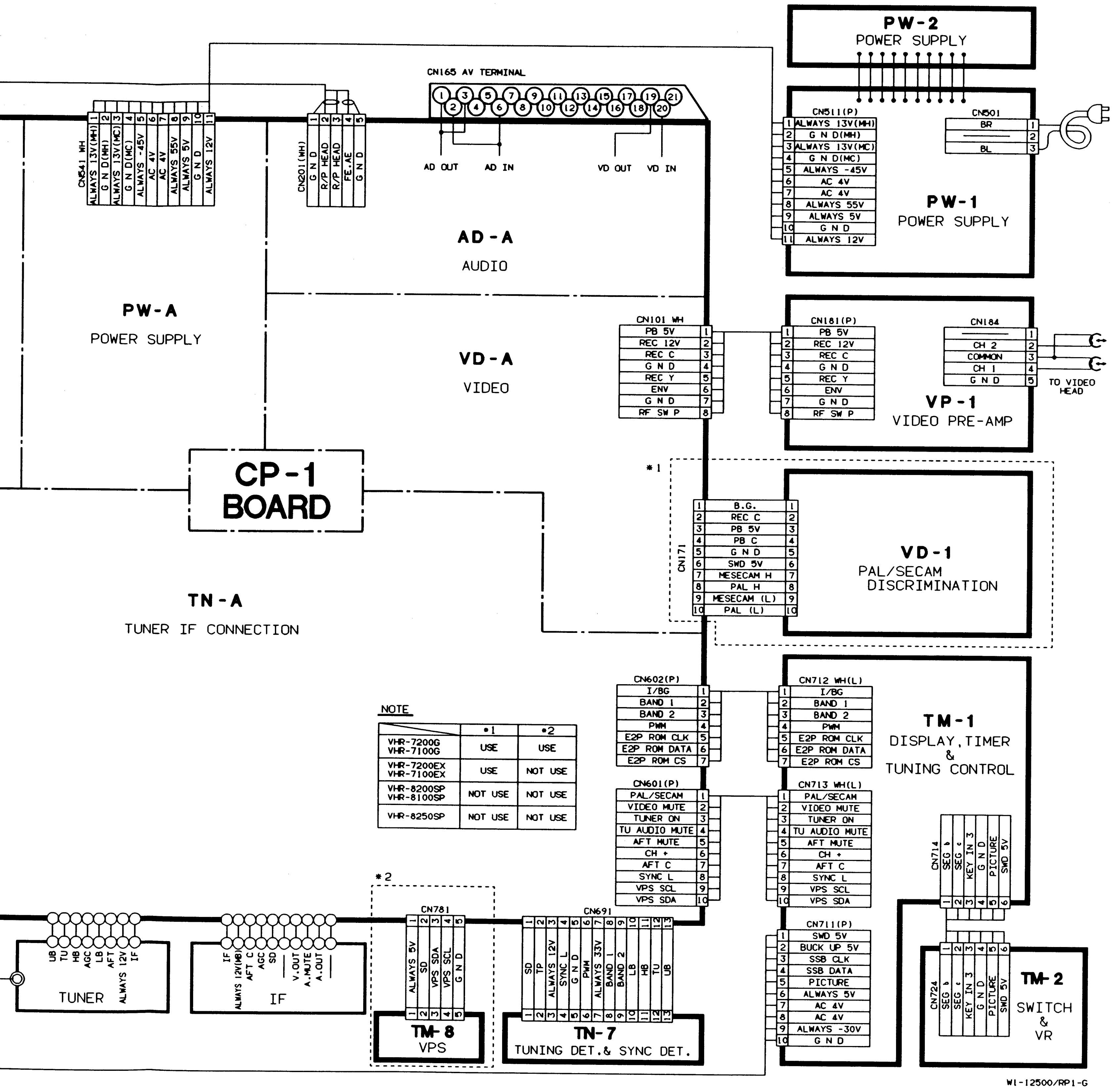
# OVERALL WIRING DIAGRAM


F/E HEAD
CN842 BR
F/E HEAD 1
G N D 2
MC-5
AUDIO/CTL HEAD
CN
F/E HEAD 1
G N D 2
CN841 BR
G N D 6
FE.AE 5
R/P HEAD 4
R/P HEAD 3
CTL + 2
CTL - 1
MH
HEAD MOTOR DRAM
CN 01 WH
DRUM PG 1
G N D 2
DRUM FG 3
ALWAYS 13V(MH) 4
DRUM VS 5
GND(MH) 6
MC
CAPSTAN MOTOR
CN 01 BR
F/R 1
CAP VS 2
3
G N D 4
CAP FG 1 5
SWD 5V 6
ALWAYS 13V(MC) 7
GND(MC) 8
MC-1
CN802 BR
G N D 1
SAFETY SW 2
SWD 5V 3
T.REEL.P 4
CN801
T.S.LED(A) 1
T.S.LED(K) 2
CN831
MC-4
T.TOP/END SENSOR LED
MC-3
CN822 WH
G N D 1
SW DATA 2 2
SW DATA 1 3
SW DATA 3 4
ML (+) 5
ML (-) 6
DEW.S 7
ME.MO SW
M.L.
CN353 WH
1 CTL +
2 CTL -
3 G N D
CN351
1 DRUM PG
2 G N D
3 DRUM FG
4 ALWAYS 13V(MH)
5 DRUM VS
6 GND(MH)
CN352 BR
1 F/R
2 CAP VS
3
4 G N D
5 CAP FG 1
6 SWD 5V
7 ALWAYS 13V(MC)
8 GND(MC)
CN302 BR
1 G N D
2 SAFETY SW
3 SWD 5V
4 T.REEL.P
CN303 WH
1 T.TOP.S.
2 GND
3 T.END.S.
4 GND
5 FL.START.SW
6 GND
CN301(P)
1 G N D
2 SW DATA 2
3 SW DATA 1
4 SW DATA 3
5 ML (+)
6 ML (-)
7 DEW.S
CN304(P)
1 SWD 5V
2 BUCK UP 5V
3 SSB CLK
4 SSB DATA
5 PICTURE
6 ALWAYS 5V
7 AC 4V
8 AC 4V
9 ALWAYS -30V
10 G N D
SV-A
SERVO
PW-A
POWER SUPPLY
SY-A
SYSTEM CONTROL
TN-A
TUNER IF CONNECTION
CP-1
BOARD
AD-A
AUDIO
VD-A
VIDEO
CV-A
RF CONVERTER
CONNECTION
2 VIDEO IN
3 AUDIO IN
4 MOD(SWD 5V)
5 G N D
6 BST.(ALWAYS 5V)
MODULATOR RF
ANT IN
RF CONVERTER
RF OUT TO TV
TUNER
UB
TU
HB
AGC
LB
AFT
ALWAYS 12V
IF
IF
IF
ALWAYS 12V(MB)
AFT C
AGC
SD
V.OUT
A.MUTE
A.OUT
CN541 WH
1 ALWAYS 13V(MH)
2 G N D(MH)
3 ALWAYS 13V(MC)
4 G N D(MC)
5 ALWAYS -45V
6 AC 4V
7 AC 4V
8 ALWAYS 55V
9 ALWAYS 5V
10 G N D
11 ALWAYS 12V
CN201(WH)
1 G N D
2 R/P HEAD
3 R/P HEAD
4 FE.AE
5 G N D
CN165 AV TERMINAL
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
AD OUT
AD IN
VD OUT
VD IN
PW-2
POWER SUPPLY
PW-1
POWER SUPPLY
CN511(P)
1 ALWAYS 13V(MH)
2 G N D(MH)
3 ALWAYS 13V(MC)
4 G N D(MC)
5 ALWAYS -45V
6 AC 4V
7 AC 4V
8 ALWAYS 55V
9 ALWAYS 5V
10 G N D
11 ALWAYS 12V
CN501
BR 1
2
BL 3
CN101 WH
PB 5V 1
REC 12V 2
REC C 3
G N D 4
REC Y 5
ENV 6
G N D 7
RF SW P 8
CN181(P)
1 PB 5V
2 REC 12V
3 REC C
4 G N D
5 REC Y
6 ENV
7 G N D
8 RF SW P
CN184
CH 2 1
COMMON 2
CH 1 3
G N D 4
5
TO VIDEO HEAD
VP-1
VIDEO PRE-AMP
*1
CN171
1 B.G. 1
2 REC C 2
3 PB 5V 3
4 PB C 4
5 G N D 5
6 SWD 5V 6
7 MESECAM H 7
8 PAL H 8
9 MESECAM (L) 9
10 PAL (L) 10
VD-1
PAL/SECAM
DISCRIMINATION
CN602(P)
I/BG 1
BAND 1 2
BAND 2 3
PWM 4
E2P ROM CLK 5
E2P ROM DATA 6
E2P ROM CS 7
CN712 WH(L)
1 I/BG
2 BAND 1
3 BAND 2
4 PWM
5 E2P ROM CLK
6 E2P ROM DATA
7 E2P ROM CS
CN601(P)
PAL/SECAM 1
VIDEO MUTE 2
TUNER ON 3
TU AUDIO MUTE 4
AFT MUTE 5
CH + 6
AFT C 7
SYNC L 8
VPS SCL 9
VPS SDA 10
CN713 WH(L)
1 PAL/SECAM
2 VIDEO MUTE
3 TUNER ON
4 TU AUDIO MUTE
5 AFT MUTE
6 CH +
7 AFT C
8 SYNC L
9 VPS SCL
10 VPS SDA
TM-1
DISPLAY, TIMER
&
TUNING CONTROL
CN711(P)
1 SWD 5V
2 BUCK UP 5V
3 SSB CLK
4 SSB DATA
5 PICTURE
6 ALWAYS 5V
7 AC 4V
8 AC 4V
9 ALWAYS -30V
10 G N D
CN714
1 SEG b
2 SEG c
3 KEY IN 3
4 G N D
5 PICTURE
6 SWD 5V
CN724
1 SEG b
2 SEG c
3 KEY IN 3
4 G N D
5 PICTURE
6 SWD 5V
TM-2
SWITCH
&
VR
*2
CN781
1 ALWAYS 5V
2 SD
3 VPS SDA
4 VPS SCL
5 G N D
TM-8
VPS
CN691
1 SD
2 TP
3 ALWAYS 12V
4 SYNC L
5 G N D
6 PWM
7 ALWAYS 33V
8 BAND 1
9 BAND 2
10 LB
11 HB
12 TU
13 UB
TN-7
TUNING DET.& SYNC DET.
W1-12500/RP1-G

NOTE

| | *1 | *2 |
|---|---|---|
| VHR-7200G<br>VHR-7100G | USE | USE |
| VHR-7200EX<br>VHR-7100EX | USE | NOT USE |
| VHR-8200SP<br>VHR-8100SP | NOT USE | NOT USE |
| VHR-8250SP | NOT USE | NOT USE |

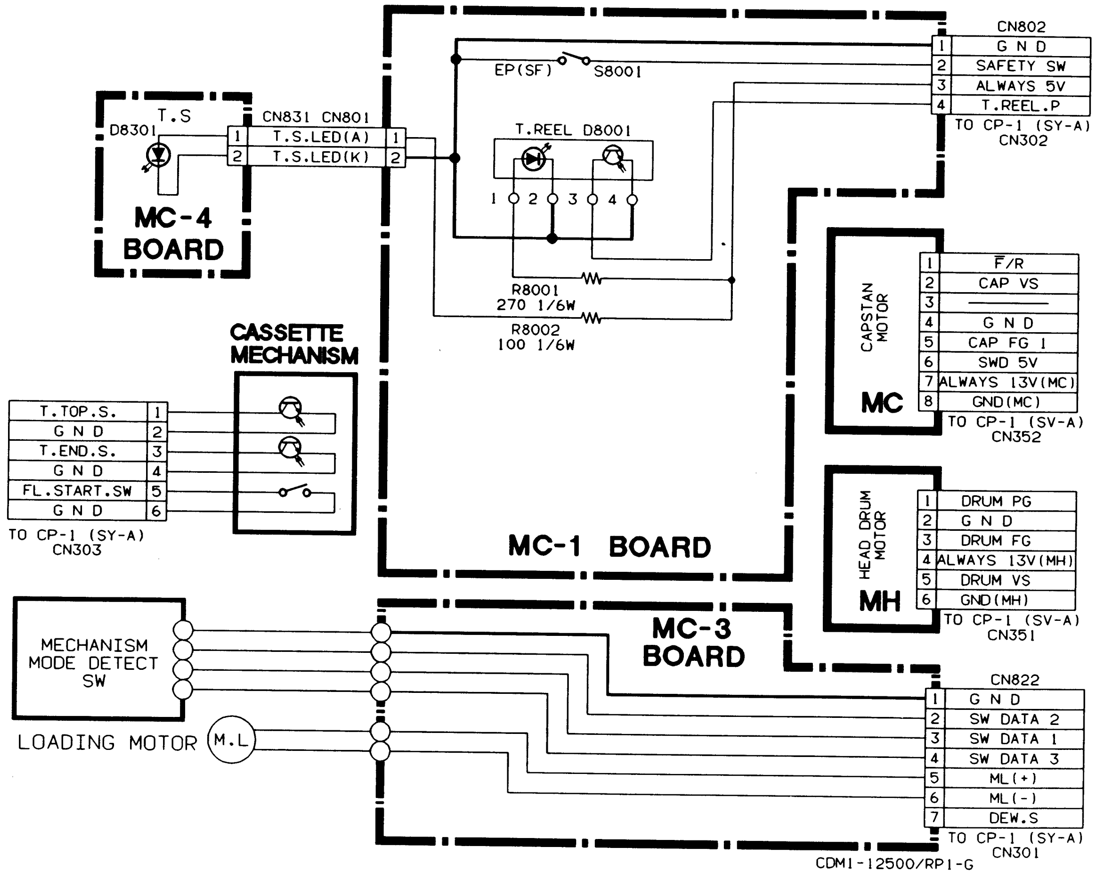
## OVERALL WIRING DIAGRAM


PW-2
POWER SUPPLY
CN165 AV TERMINAL
AD OUT
AD IN
VD OUT
VD IN
CN511(P)
ALWAYS 13V(MH)
G N D(MH)
ALWAYS 13V(MC)
G N D(MC)
ALWAYS -45V
AC 4V
AC 4V
ALWAYS 55V
ALWAYS 5V
G N D
ALWAYS 12V
CN501
BR
BL
PW-1
POWER SUPPLY
CN541 WH
CN201(WH)
G N D
R/P HEAD
R/P HEAD
FE.AE
AD-A
AUDIO
PW-A
POWER SUPPLY
VD-A
VIDEO
CN101 WH
PB 5V
REC 12V
REC C
G N D
REC Y
ENV
RF SW P
CN181(P)
CN184
CH 2
COMMON
CH 1
TO VIDEO HEAD
VP-1
VIDEO PRE-AMP
CP-1
BOARD
*1
CN171
B.G.
PB C
SWD 5V
MESECAM H
PAL H
MESECAM (L)
PAL (L)
VD-1
PAL/SECAM
DISCRIMINATION
TN-A
TUNER IF CONNECTION
CN602(P)
I/BG
BAND 1
BAND 2
PWM
E2P ROM CLK
E2P ROM DATA
E2P ROM CS
CN712 WH(L)
TM-1
DISPLAY, TIMER
&
TUNING CONTROL
CN601(P)
PAL/SECAM
VIDEO MUTE
TUNER ON
TU AUDIO MUTE
AFT MUTE
CH +
AFT C
SYNC L
VPS SCL
VPS SDA
CN713 WH(L)
CN711(P)
SWD 5V
BUCK UP 5V
SSB CLK
SSB DATA
PICTURE
ALWAYS 5V
AC 4V
ALWAYS -30V
CN714
SEG b
SEG c
KEY IN 3
PICTURE
CN724
TM-2
SWITCH
&
VR
*2
CN781
ALWAYS 5V
SD
VPS SDA
VPS SCL
TM-8
VPS
CN691
TP
ALWAYS 12V
SYNC L
PWM
ALWAYS 33V
LB
HB
TU
UB
TN-7
TUNING DET.& SYNC DET.
TUNER
AGC
AFT
IF
V.OUT
A.MUTE
A.OUT
W1-12500/RP1-G

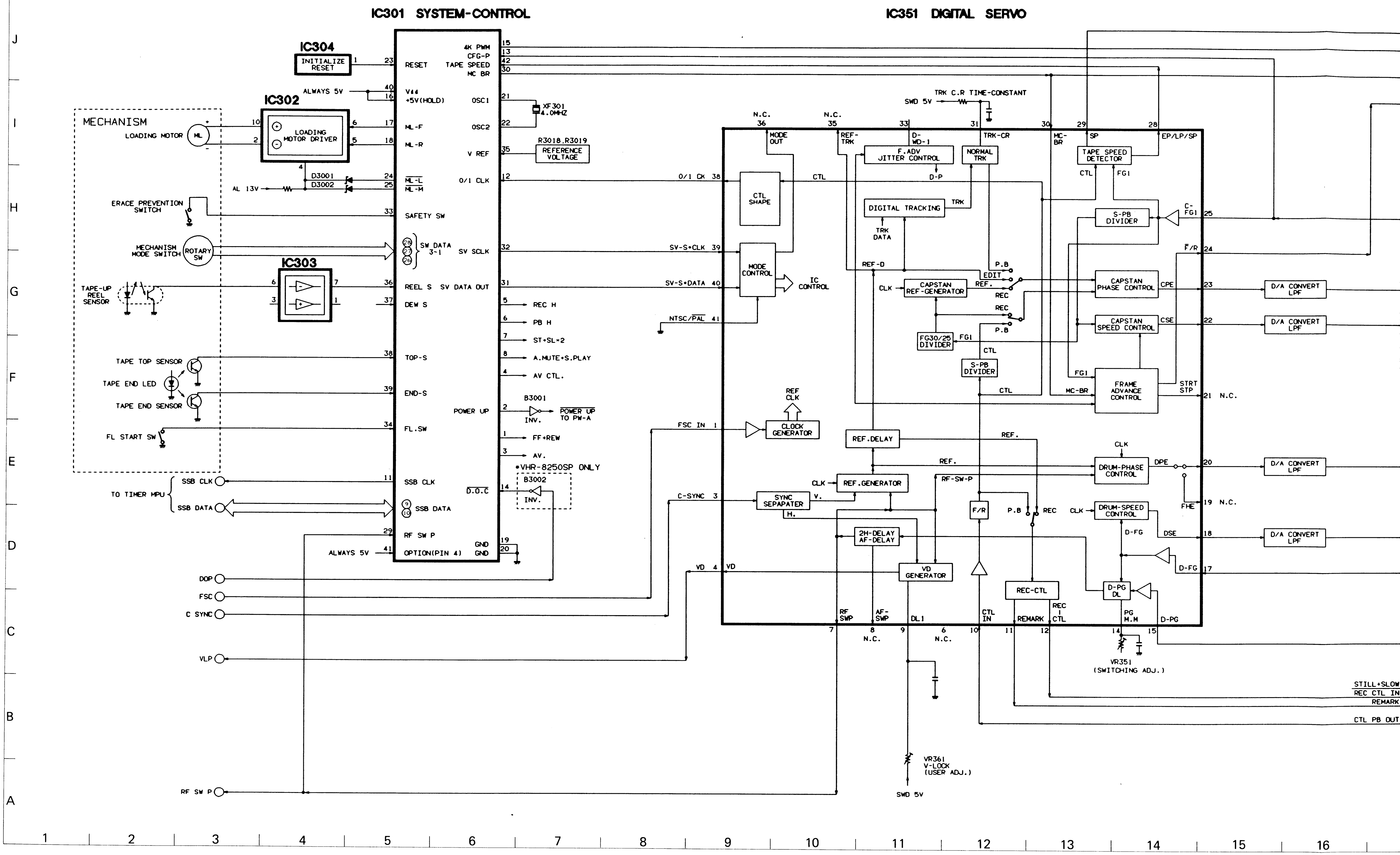
NOTE

| | *1 | *2 |
|---|---|---|
| VHR-7200G<br>VHR-7100G | USE | USE |
| VHR-7200EX<br>VHR-7100EX | USE | NOT USE |
| VHR-8200SP<br>VHR-8100SP | NOT USE | NOT USE |
| VHR-8250SP | NOT USE | NOT USE |

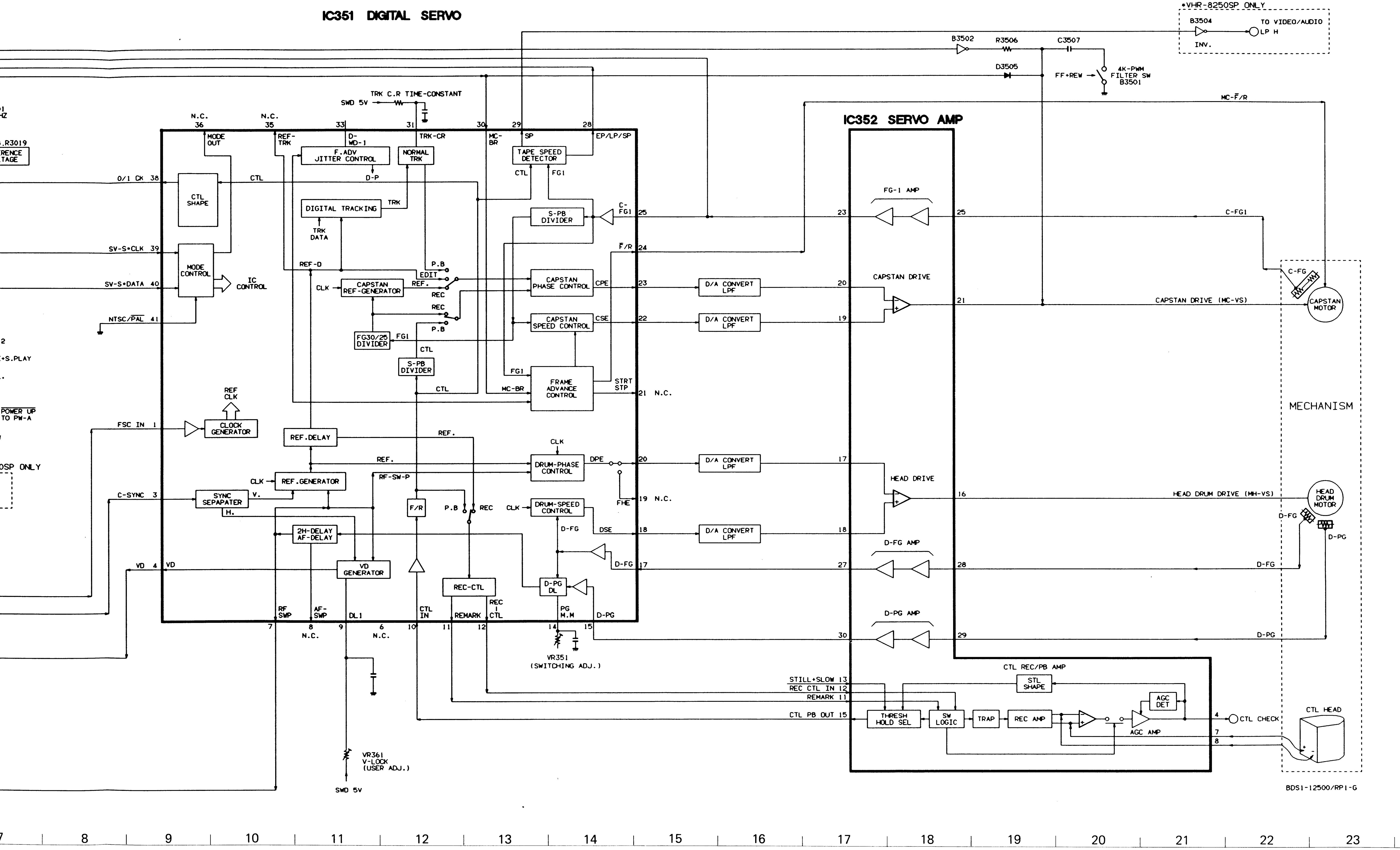
## MECHANISM CONNECTION CIRCUIT


CN802
G N D
SAFETY SW
ALWAYS 5V
T.REEL.P
TO CP-1 (SY-A)
CN302
EP(SF)
S8001
T.S
D8301
CN831 CN801
T.S.LED(A)
T.S.LED(K)
T.REEL D8001
MC-4
BOARD
R8001
270 1/6W
R8002
100 1/6W
CASSETTE
MECHANISM
T.TOP.S.
G N D
T.END.S.
FL.START.SW
TO CP-1 (SY-A)
CN303
CAPSTAN MOTOR
MC
F/R
CAP VS
CAP FG 1
SWD 5V
ALWAYS 13V(MC)
GND(MC)
TO CP-1 (SV-A)
CN352
MC-1 BOARD
HEAD DRUM MOTOR
MH
DRUM PG
DRUM FG
ALWAYS 13V(MH)
DRUM VS
GND(MH)
TO CP-1 (SV-A)
CN351
MC-3
BOARD
MECHANISM
MODE DETECT
SW
LOADING MOTOR
M.L
CN822
SW DATA 2
SW DATA 1
SW DATA 3
ML(+)
ML(-)
DEW.S
TO CP-1 (SY-A)
CN301
CDM1-12500/RP1-G

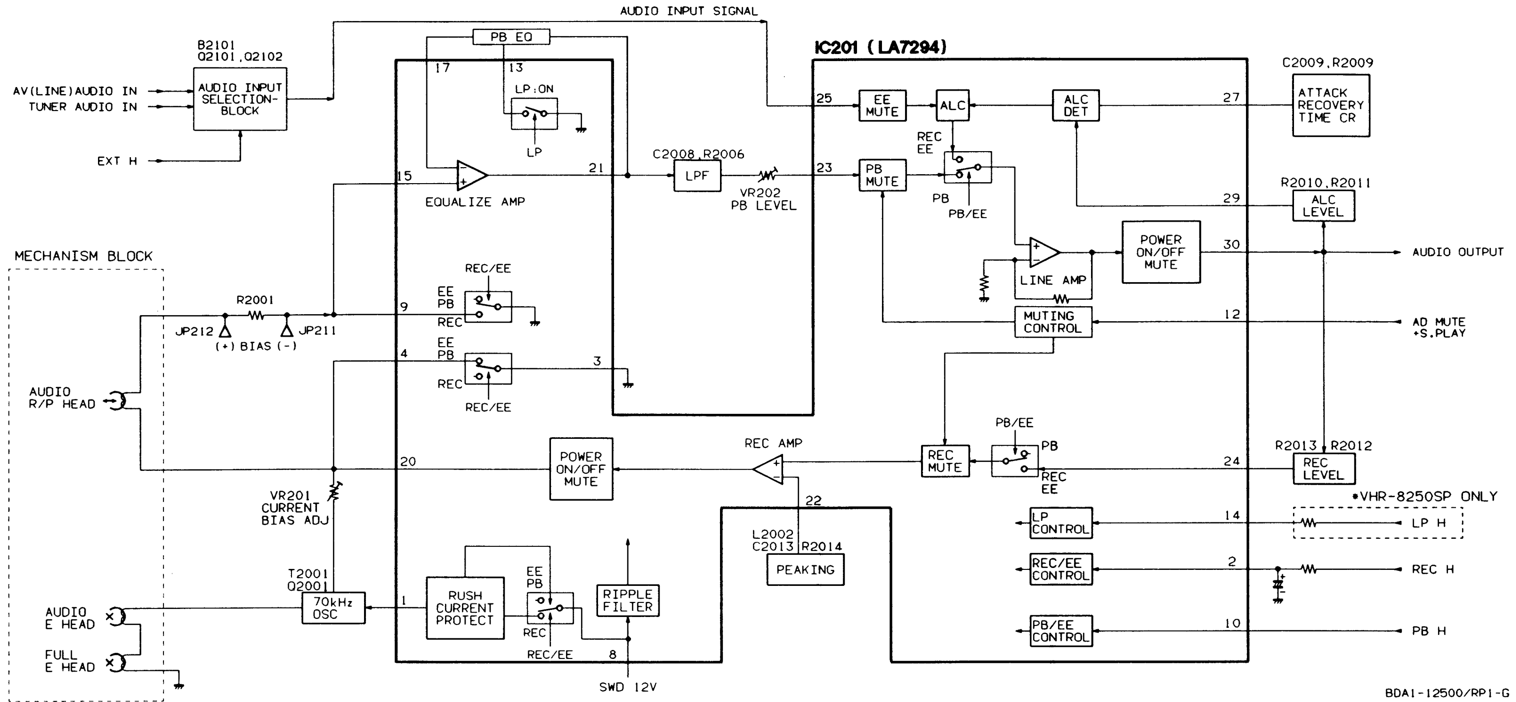
## SYSTEM CONTROL & SERVO CIRCUIT BASIC BLOCK DIAGRAM


IC301 SYSTEM-CONTROL
IC351 DIGITAL SERVO
IC304
INITIALIZE RESET
RESET
4K PWM
CFG-P
TAPE SPEED
MC BR
ALWAYS 5V
V44
+5V(HOLD)
OSC1
OSC2
XF301
4.0MHZ
IC302
MECHANISM
LOADING MOTOR
ML
LOADING MOTOR DRIVER
ML-F
ML-R
V REF
R3018.R3019
REFERENCE VOLTAGE
AL 13V
D3001
D3002
ML-L
ML-M
0/1 CLK
ERACE PREVENTION SWITCH
SAFETY SW
MECHANISM MODE SWITCH
ROTARY SW
SW DATA 3-1
SV SCLK
IC303
TAPE-UP REEL SENSOR
REEL S
SV DATA OUT
DEW S
REC H
PB H
ST+SL×2
A.MUTE+S.PLAY
AV CTL.
TAPE TOP SENSOR
TOP-S
TAPE END LED
TAPE END SENSOR
END-S
POWER UP
B3001
INV.
POWER UP TO PW-A
FL START SW
FL.SW
FF+REW
AV.
•VHR-8250SP ONLY
B3002
INV.
SSB CLK
D.O.C
TO TIMER MPU
SSB DATA
RF SW P
ALWAYS 5V
OPTION(PIN 4)
GND
GND
DOP
FSC
C SYNC
VLP
RF SW P
TRK C.R TIME-CONSTANT
SWD 5V
N.C.
N.C.
MODE OUT
REF-TRK
D-WD-1
F.ADV JITTER CONTROL
D-P
NORMAL TRK
TRK-CR
MC-BR
SP
EP/LP/SP
TAPE SPEED DETECTOR
CTL
FGI
0/1 CK 38
CTL SHAPE
DIGITAL TRACKING
TRK
TRK DATA
C-FG1
S-PB DIVIDER
SV-S•CLK 39
MODE CONTROL
IC CONTROL
F/R
REF-D
EDIT
P.B
SV-S•DATA 40
CLK
CAPSTAN REF-GENERATOR
REF.
REC
CAPSTAN PHASE CONTROL
CPE
D/A CONVERT LPF
NTSC/PAL 41
CAPSTAN SPEED CONTROL
CSE
FG30/25 DIVIDER
FG1
S-PB DIVIDER
FRAME ADVANCE CONTROL
STRT STP
MC-BR
21 N.C.
REF CLK
FSC IN 1
CLOCK GENERATOR
REF.DELAY
DRUM-PHASE CONTROL
DPE
FHE
19 N.C.
REF.GENERATOR
RF-SW-P
C-SYNC 3
SYNC SEPAPATER
V.
H.
F/R
P.B
REC
DRUM-SPEED CONTROL
D-FG
DSE
2H-DELAY AF-DELAY
VD 4
VD
VD GENERATOR
REC-CTL
D-PG DL
D-FG
RF SWP
AF-SWP
DL1
CTL IN
REMARK
REC I CTL
PG M.M
D-PG
N.C.
N.C.
VR351 (SWITCHING ADJ.)
VR361 V-LOCK (USER ADJ.)
SWD 5V
STILL+SLOW
REC CTL IN
REMARK
CTL PB OUT

## SYSTEM CONTROL & SERVO CIRCUIT BASIC BLOCK DIAGRAM

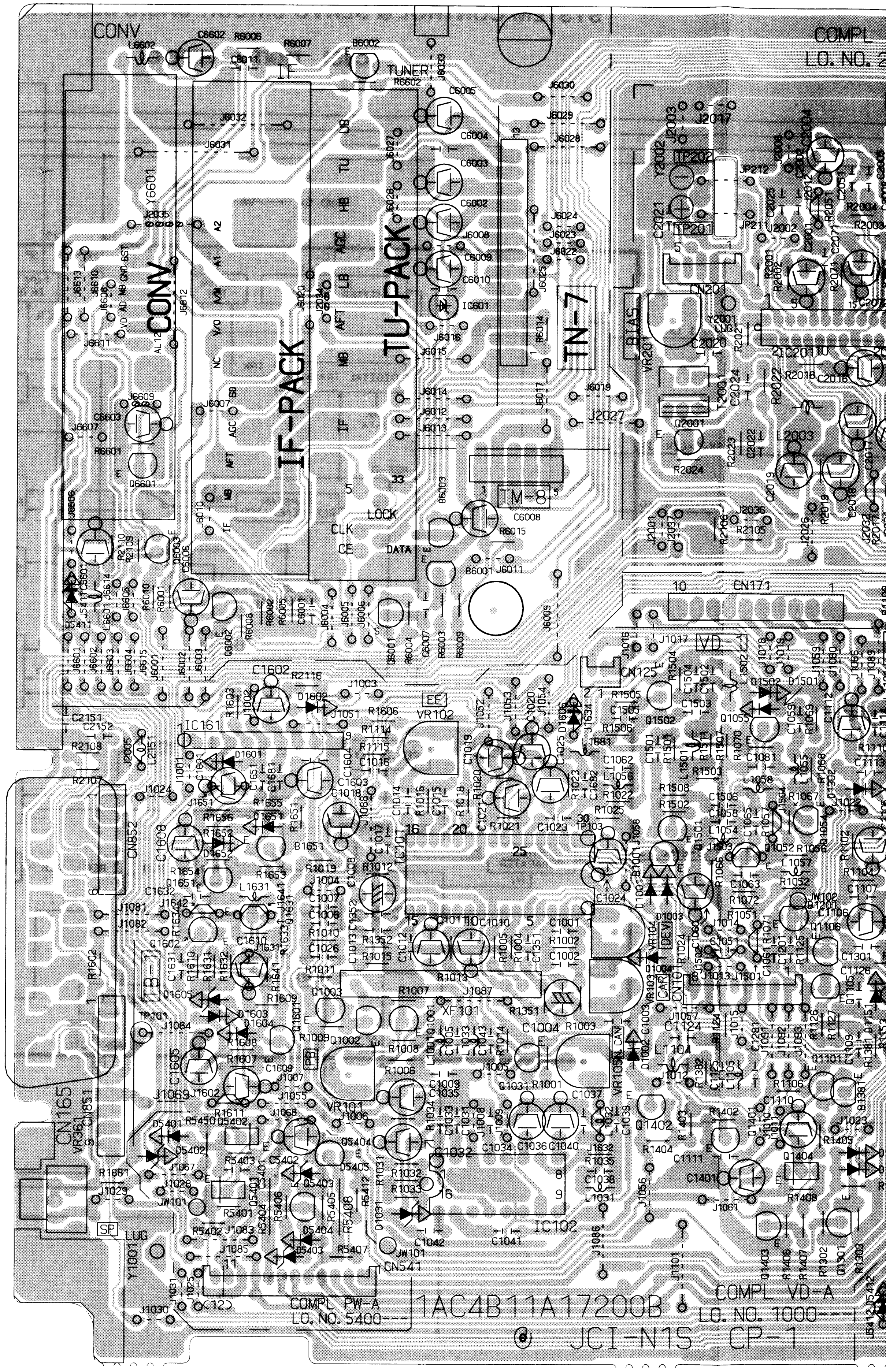

IC351 DIGITAL SERVO
•VHR-8250SP ONLY
B3504
INV.
TO VIDEO/AUDIO
LP H
B3502
R3506
C3507
D3505
FF•REW
4K-PWM
FILTER SW
B3501
MC-F̄/R
TRK C.R TIME-CONSTANT
SWD 5V
N.C.
36
N.C.
35
33
31
30
29
28
MODE OUT
REF-TRK
D-WD-1
F.ADV JITTER CONTROL
D-P
NORMAL TRK
TRK-CR
MC-BR
SP
TAPE SPEED DETECTOR
EP/LP/SP
CTL
FG1
.R3019
RENCE
TAGE
0/1 CK 38
CTL SHAPE
DIGITAL TRACKING
TRK
TRK DATA
S-PB DIVIDER
C-FG1
25
SV-S•CLK 39
MODE CONTROL
IC CONTROL
SV-S•DATA 40
REF-D
P.B
EDIT
REF.
CLK
CAPSTAN REF-GENERATOR
REC
CAPSTAN PHASE CONTROL
CPE
F̄/R
24
23
NTSC/P̄ĀL̄ 41
CAPSTAN SPEED CONTROL
CSE
22
FG30/25 DIVIDER
FG1
CTL
S-PB DIVIDER
FRAME ADVANCE CONTROL
STRT STP
21 N.C.
+S.PLAY
REF CLK
CLOCK GENERATOR
POWER UP TO PW-A
FSC IN 1
REF.DELAY
REF.
DRUM-PHASE CONTROL
DPE
20
0SP ONLY
REF.GENERATOR
RF-SW-P
C-SYNC 3
SYNC SEPAPATER
V.
H.
F/R
DRUM-SPEED CONTROL
FHE
19 N.C.
2H-DELAY AF-DELAY
D-FG
DSE
18
VD 4
VD
VD GENERATOR
D-PG DL
17
REC-CTL
REMARK
REC I CTL
RF SWP
AF-SWP
DL1
CTL IN
PG M.M
D-PG
7
8
N.C.
9
6
N.C.
10
11
12
14
15
VR351 (SWITCHING ADJ.)
VR361 V-LOCK (USER ADJ.)
SWD 5V
IC352 SERVO AMP
FG-1 AMP
23
C-FG1
D/A CONVERT LPF
20
CAPSTAN DRIVE
21
CAPSTAN DRIVE (MC-VS)
19
C-FG
CAPSTAN MOTOR
MECHANISM
17
HEAD DRIVE
16
HEAD DRUM DRIVE (MH-VS)
HEAD DRUM MOTOR
D-FG
D-PG
D-FG AMP
27
28
D-PG AMP
30
29
CTL REC/PB AMP
STL SHAPE
STILL•SLOW 13
REC CTL IN 12
REMARK 11
CTL PB OUT 15
THRESH HOLD SEL
SW LOGIC
TRAP
REC AMP
AGC DET
AGC AMP
4
CTL CHECK
7
8
CTL HEAD
BDS1-12500/RP1-G
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

## AUDIO CIRCUIT BASIC BLOCK DIAGRAM


AUDIO INPUT SIGNAL
B2101
Q2101, Q2102
AV(LINE)AUDIO IN
TUNER AUDIO IN
AUDIO INPUT SELECTION-BLOCK
EXT H
PB EQ
17
13
LP:ON
LP
15
EQUALIZE AMP
21
C2008, R2006
LPF
VR202
PB LEVEL
IC201 (LA7294)
25
EE MUTE
ALC
ALC DET
27
C2009, R2009
ATTACK RECOVERY TIME CR
23
PB MUTE
REC
EE
PB
PB/EE
29
R2010, R2011
ALC LEVEL
LINE AMP
POWER ON/OFF MUTE
30
AUDIO OUTPUT
MUTING CONTROL
12
AD MUTE
•S.PLAY
MECHANISM BLOCK
R2001
JP212
JP211
(+) BIAS (-)
9
EE
PB
REC
REC/EE
4
3
AUDIO R/P HEAD
20
POWER ON/OFF MUTE
REC AMP
REC MUTE
PB/EE
PB
REC
EE
24
R2013
R2012
REC LEVEL
22
•VHR-8250SP ONLY
VR201
CURRENT BIAS ADJ
L2002
C2013
R2014
PEAKING
LP CONTROL
14
LP H
T2001
Q2001
70kHz OSC
1
RUSH CURRENT PROTECT
RIPPLE FILTER
REC/EE CONTROL
2
REC H
AUDIO E HEAD
FULL E HEAD
8
PB/EE CONTROL
10
PB H
SWD 12V

BDA1-12500/RP1-G

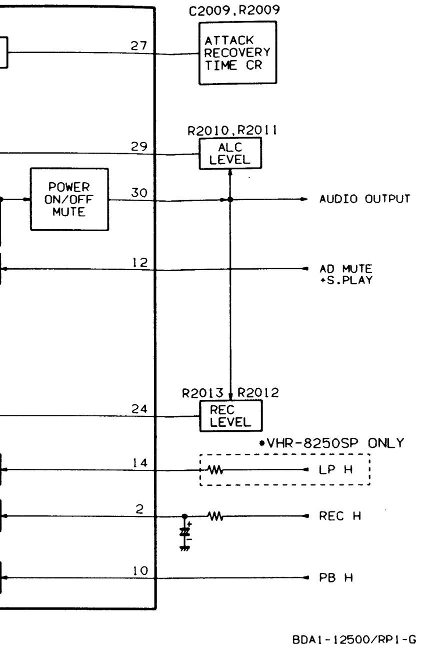
## CP-1 P.C.B.

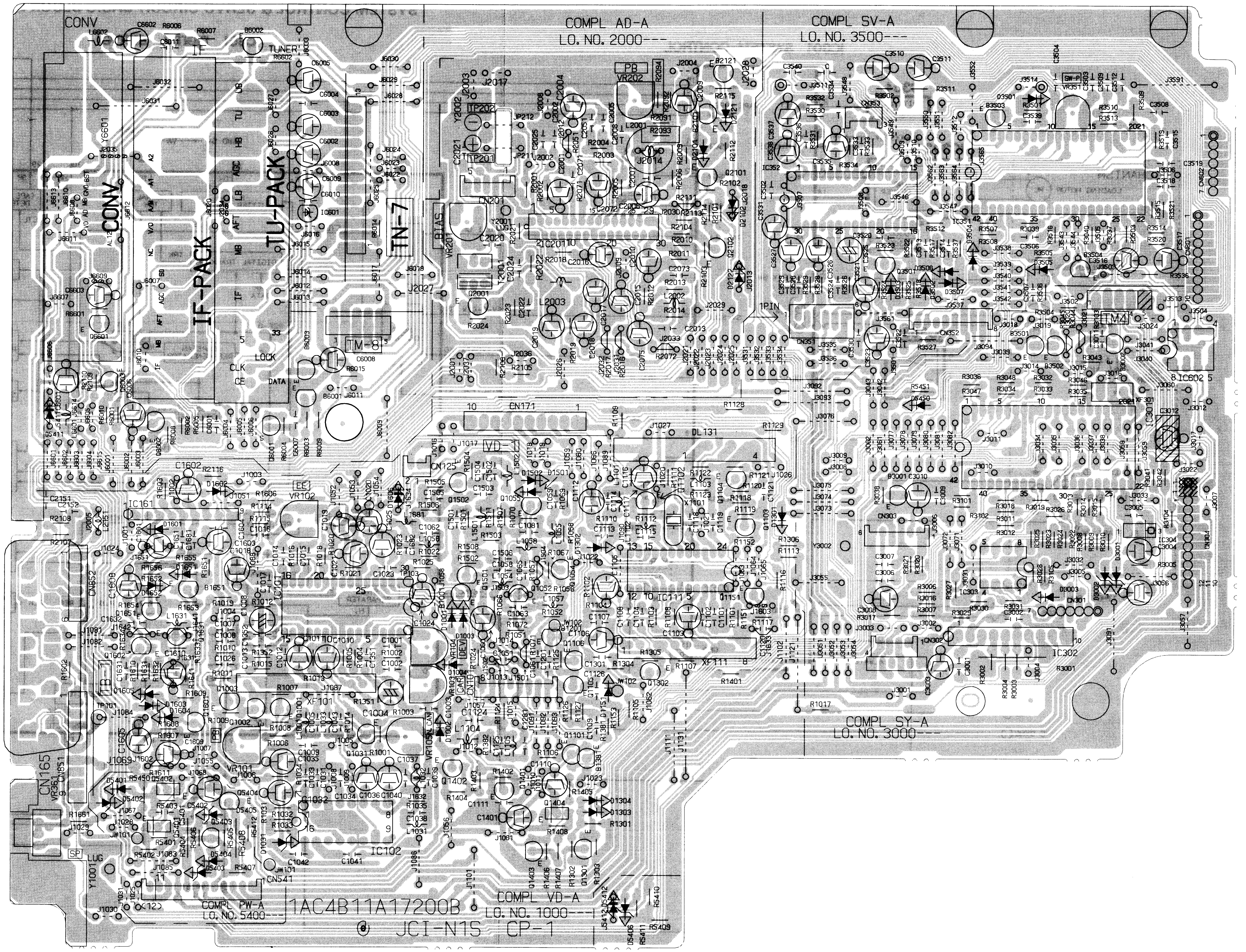

CONV
IF-PACK
TU-PACK
TN-7
TM-8
TUNER
COMPL
LO. NO. 2
CN201
CN171
VD-1
IC161
IC101
IC102
XF101
VR101
VR102
VR201
CN852
CN851
CN165
VR361
CN541
TB-1
LUG
SP
EE
BIAS
COMPL PW-A
LO. NO. 5400
1AC4B11A17200B
COMPL VD-A
LO. NO. 1000
JCI-N15
CP-1

K
J
I
H
G
F
E
D
C
B
A

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

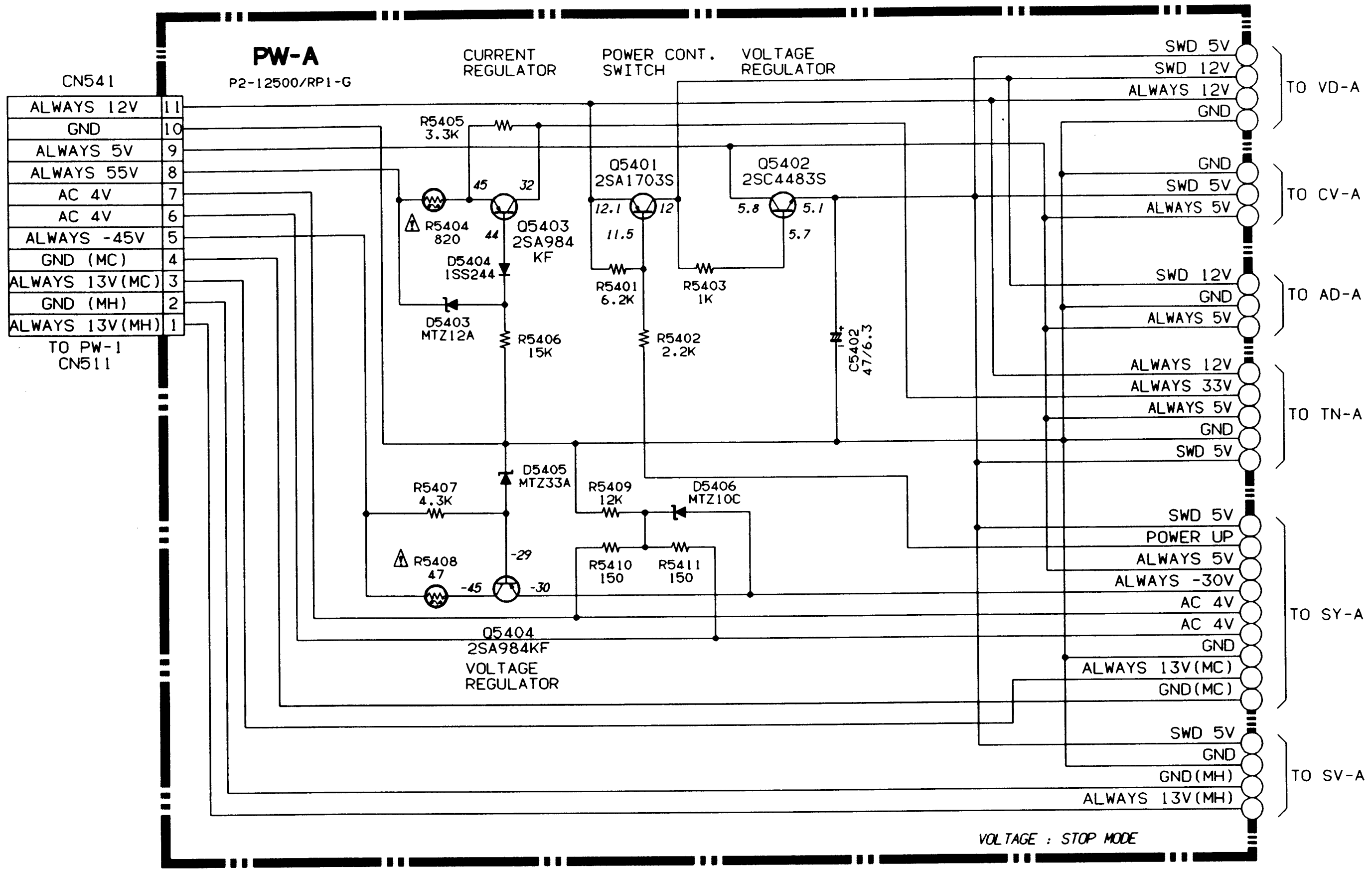
# CP-1 P.C.B.


C2009,R2009
ATTACK RECOVERY TIME CR
27
R2010,R2011
ALC LEVEL
29
POWER ON/OFF MUTE
30
AUDIO OUTPUT
12
AD MUTE +S.PLAY
R2013,R2012
REC LEVEL
24
*VHR-8250SP ONLY
14
LP H
2
REC H
10
PB H
BDA1-12500/RP1-G

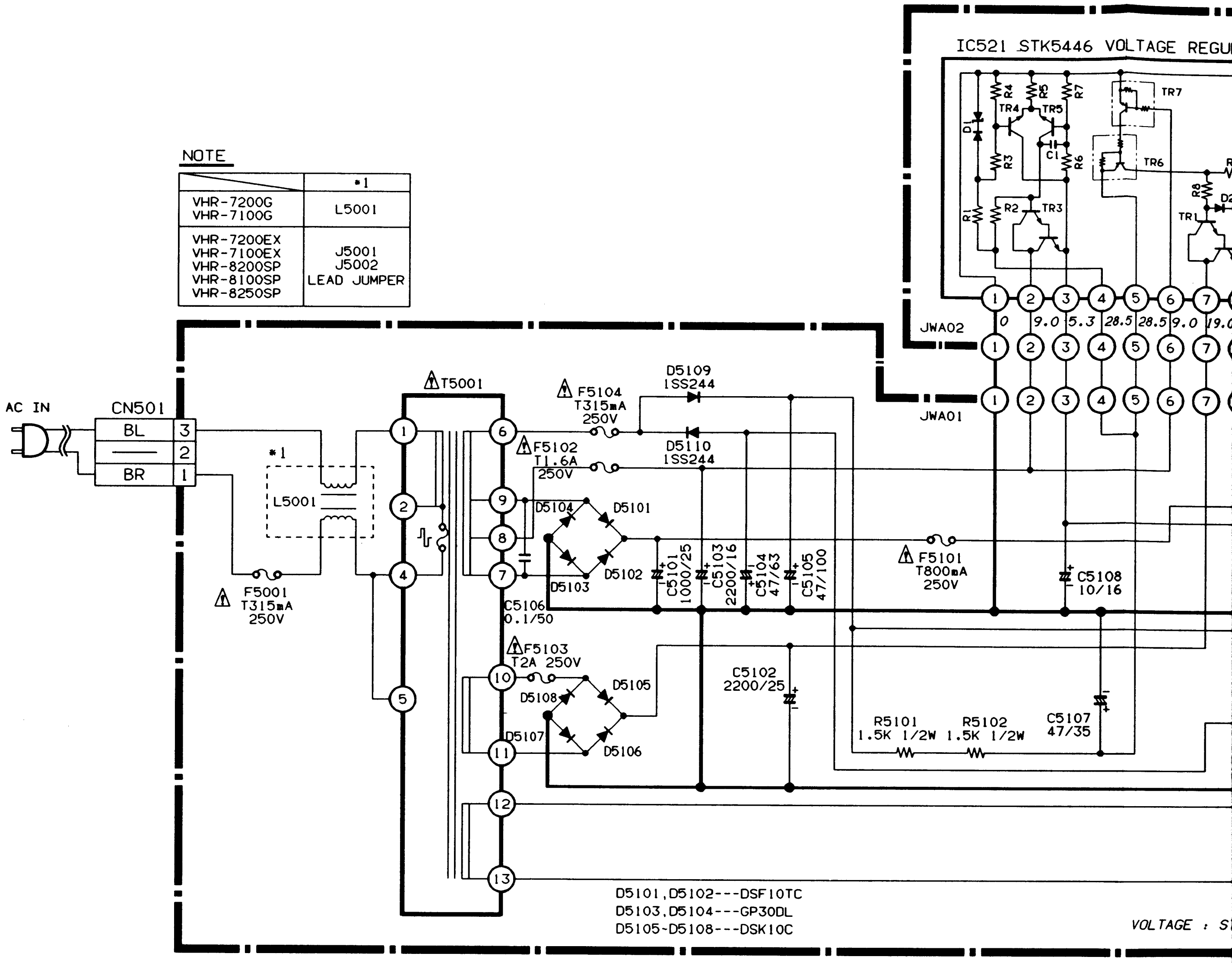

CONV
IF-PACK
TU-PACK
TUNER
TN-7
TM-8
BIAS
COMPL AD-A
LO. NO. 2000---
COMPL SV-A
LO. NO. 3500---
TM-4
1PIN
CN171
DL131
VD-1
IC161
IC101
IC102
IC111
IC302
IC303
IC304
IC351
IC352
IC601
IC602
IC2011
CN201
CN351
CN352
CN651
CN652
CN165
CN541
CN301
CN302
CN303
CN304
LUG
SP
COMPL SY-A
LO. NO. 3000---
COMPL PW-A
LO. NO. 5400---
1AC4B11A17200B
COMPL VD-A
LO. NO. 1000---
JCI-N1S CP-1

8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

## CP-1 BOARD (PW-A) POWER SUPPLY CIRCUIT DIAGRAM


PW-A
P2-12500/RP1-G
CN541
ALWAYS 12V 11
GND 10
ALWAYS 5V 9
ALWAYS 55V 8
AC 4V 7
AC 4V 6
ALWAYS -45V 5
GND (MC) 4
ALWAYS 13V(MC) 3
GND (MH) 2
ALWAYS 13V(MH) 1
TO PW-1 CN511
CURRENT REGULATOR
POWER CONT. SWITCH
VOLTAGE REGULATOR
R5405 3.3K
R5404 820
Q5403 2SA984KF
D5404 1SS244
D5403 MTZ12A
R5406 15K
Q5401 2SA1703S
Q5402 2SC4483S
R5401 6.2K
R5403 1K
R5402 2.2K
C5402 47/6.3
D5405 MTZ33A
R5407 4.3K
R5409 12K
D5406 MTZ10C
R5408 47
R5410 150
R5411 150
Q5404 2SA984KF VOLTAGE REGULATOR
SWD 5V
SWD 12V
ALWAYS 12V
GND
TO VD-A
GND
SWD 5V
ALWAYS 5V
TO CV-A
SWD 12V
GND
ALWAYS 5V
TO AD-A
ALWAYS 12V
ALWAYS 33V
ALWAYS 5V
GND
SWD 5V
TO TN-A
SWD 5V
POWER UP
ALWAYS 5V
ALWAYS -30V
AC 4V
AC 4V
GND
ALWAYS 13V(MC)
GND(MC)
TO SY-A
SWD 5V
GND
GND(MH)
ALWAYS 13V(MH)
TO SV-A
VOLTAGE : STOP MODE

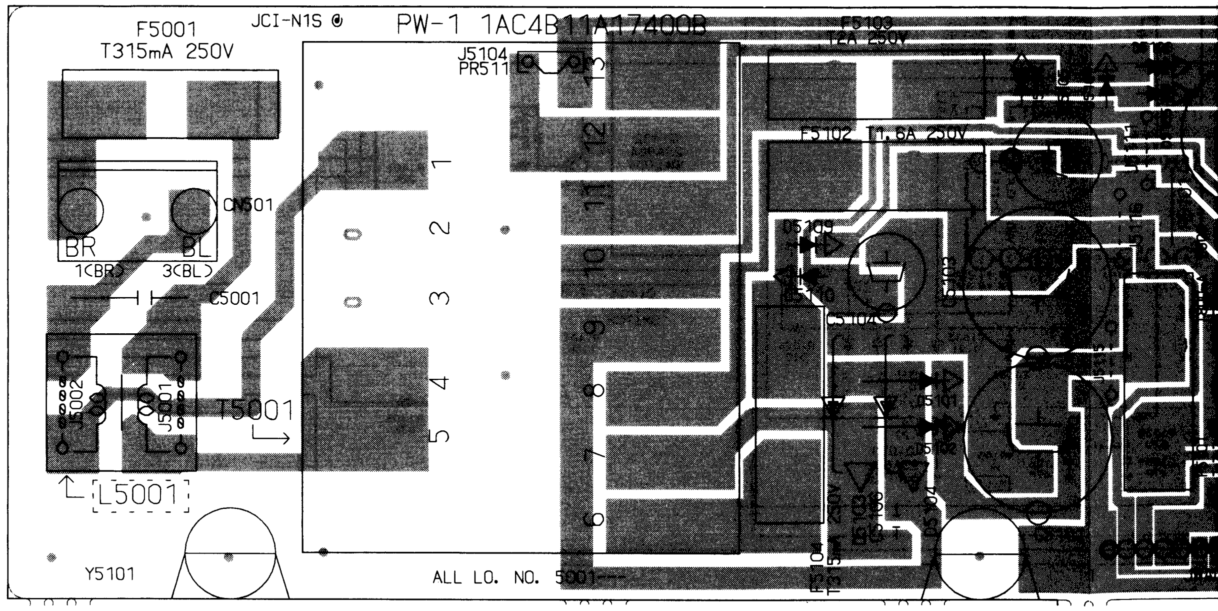
## PW-1,2 BOARD POWER SUPPLY CIRCUIT DIAGRAM


IC521 STK5446 VOLTAGE REGU
TR4
TR5
TR7
TR6
TR3
TR1
JWA02
JWA01
AC IN
CN501
BL
BR
L5001
F5001 T315mA 250V
T5001
F5104 T315mA 250V
F5102 T1.6A 250V
D5109 1SS244
D5110 1SS244
D5104
D5101
D5103
D5102
C5101 1000/25
C5103 2200/16
C5104 47/63
C5105 47/100
F5101 T800mA 250V
C5108 10/16
C5106 0.1/50
F5103 T2A 250V
D5108
D5105
D5107
D5106
C5102 2200/25
R5101 1.5K 1/2W
R5102 1.5K 1/2W
C5107 47/35
D5101,D5102---DSF10TC
D5103,D5104---GP30DL
D5105-D5108---DSK10C
VOLTAGE : S

NOTE

| | *1 |
|---|---|
| VHR-7200G<br>VHR-7100G | L5001 |
| VHR-7200EX<br>VHR-7100EX<br>VHR-8200SP<br>VHR-8100SP<br>VHR-8250SP | J5001<br>J5002<br>LEAD JUMPER |

## PW-1 P.C.B.


F5001 T315mA 250V
JCI-N1S
PW-1 1AC4B11A17400B
J5104 PR511
F5103 T2A 250V
F5102 T1.6A 250V
CN501
BR 1(BR)
BL 3(BL)
C5001
J5002
J5001
T5001
L5001
Y5101
ALL LO. NO. 5001

# PW-1,2 BOARD POWER SUPPLY CIRCUIT DIAGRAM

VD-A

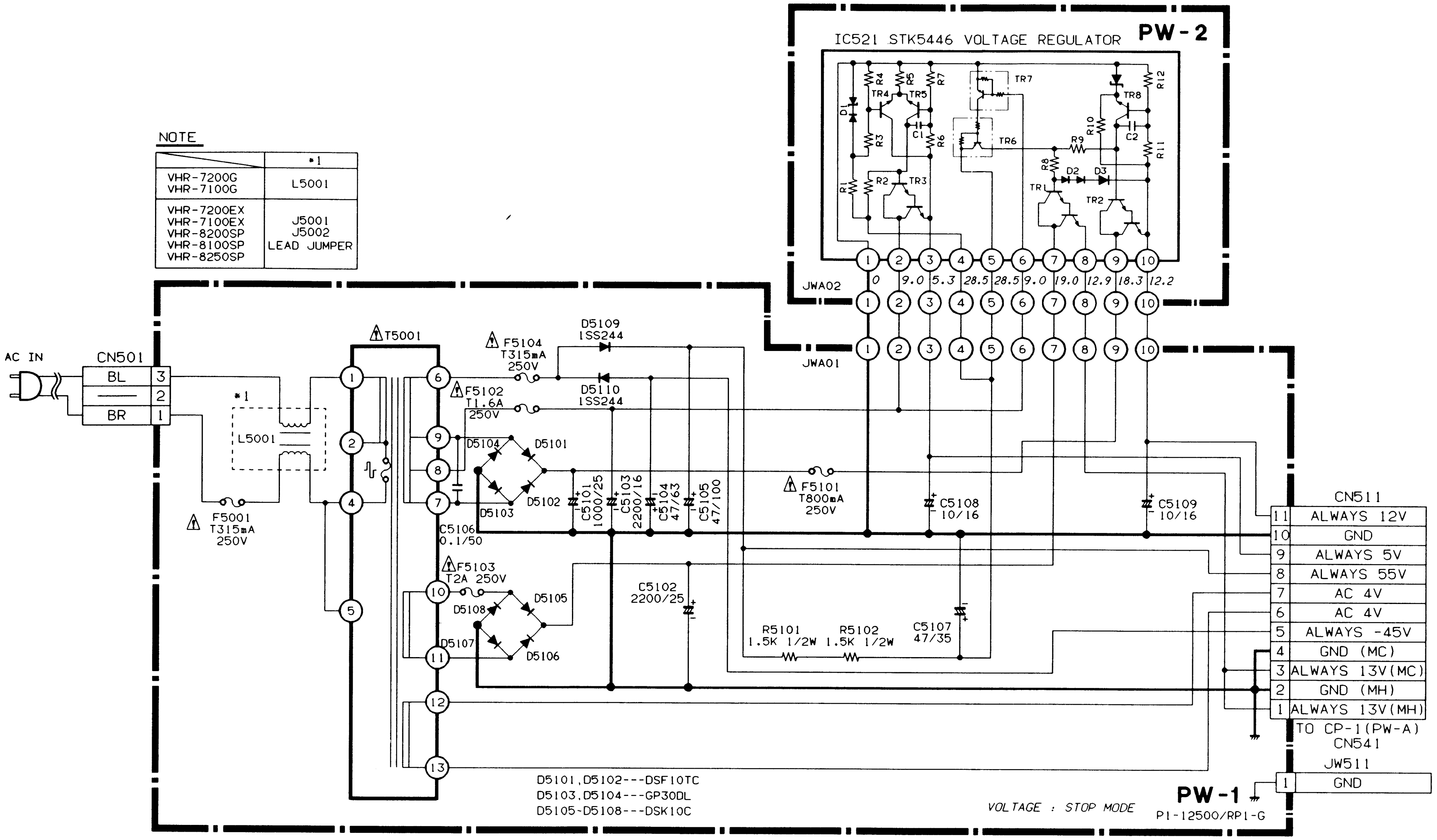
CV-A

AD-A

TN-A

SY-A

SV-A

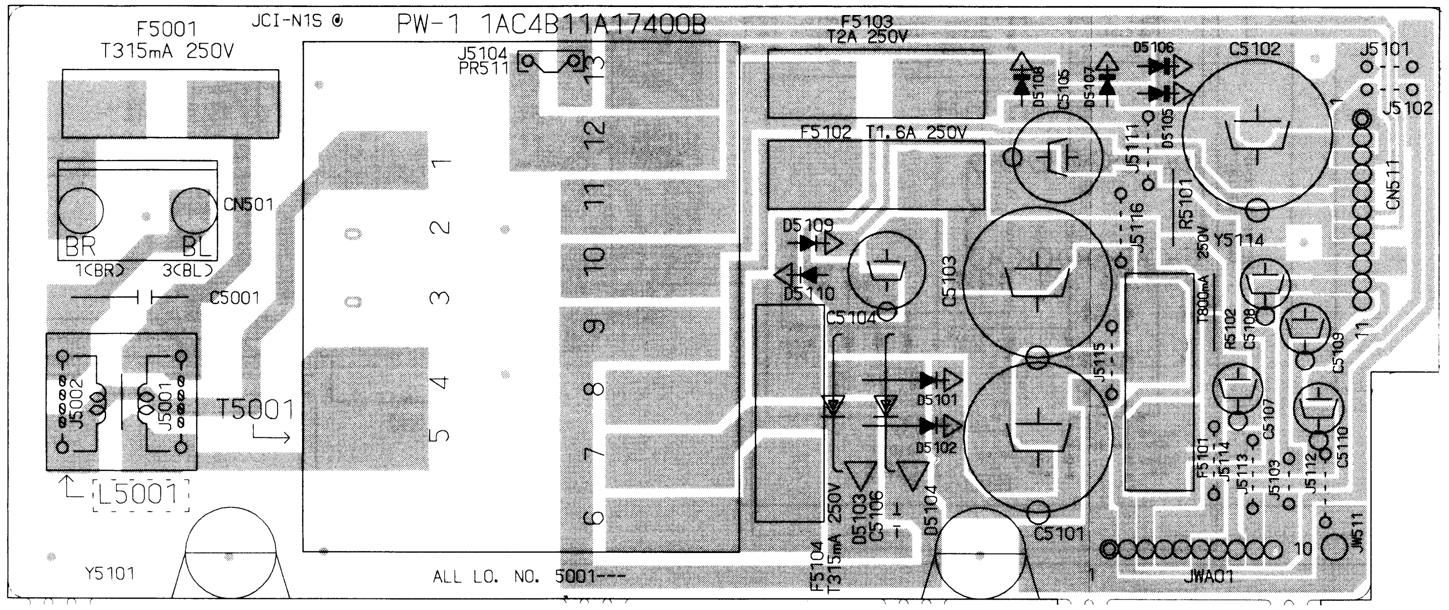


NOTE

| | *1 |
|---|---|
| VHR-7200G<br>VHR-7100G | L5001 |
| VHR-7200EX<br>VHR-7100EX<br>VHR-8200SP<br>VHR-8100SP<br>VHR-8250SP | J5001<br>J5002<br>LEAD JUMPER |

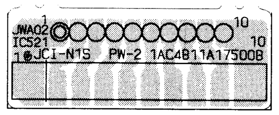
IC521 STK5446 VOLTAGE REGULATOR
PW-2
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
D1
D2
D3
C1
C2
TR1
TR2
TR3
TR4
TR5
TR6
TR7
TR8
JWA02
0
9.0
5.3
28.5
28.5
9.0
19.0
12.9
18.3
12.2
JWA01
AC IN
CN501
BL
BR
3
2
1
*1
L5001
⚠ F5001
T315mA
250V
⚠T5001
⚠ F5104
T315mA
250V
⚠F5102
T1.6A
250V
D5109
1SS244
D5110
1SS244
D5104
D5101
D5103
D5102
C5101
1000/25
C5103
2200/16
C5104
47/63
C5105
47/100
C5106
0.1/50
⚠F5103
T2A 250V
D5108
D5105
D5107
D5106
C5102
2200/25
⚠ F5101
T800mA
250V
C5108
10/16
C5109
10/16
R5101
1.5K 1/2W
R5102
1.5K 1/2W
C5107
47/35
D5101,D5102---DSF10TC
D5103,D5104---GP30DL
D5105-D5108---DSK10C
VOLTAGE : STOP MODE
PW-1
P1-12500/RP1-G
CN511
11 ALWAYS 12V
10 GND
9 ALWAYS 5V
8 ALWAYS 55V
7 AC 4V
6 AC 4V
5 ALWAYS -45V
4 GND (MC)
3 ALWAYS 13V(MC)
2 GND (MH)
1 ALWAYS 13V(MH)
TO CP-1(PW-A)
CN541
JW511
1 GND

## PW-1 P.C.B.



F5001
T315mA 250V
JCI-N1S
PW-1 1AC4B11A17400B
J5104
PR511
CN501
BR
BL
1(BR)
3(BL)
C5001
J5002
J5001
T5001
L5001
Y5101
ALL LO. NO. 5001---
F5103
T2A 250V
F5102 T1.6A 250V
D5108
D5105
D5107
D5106
C5102
J5101
J5102
J5111
J5116
R5101
CN511
D5109
D5110
C5104
C5103
Y5114
T800mA
R5102
C5108
C5109
D5101
D5102
D5103
D5104
C5106
J5115
F5101
J5114
J5113
C5107
J5103
J5112
C5110
JW511
F5104
T315mA 250V
C5101
JWA01
10
11

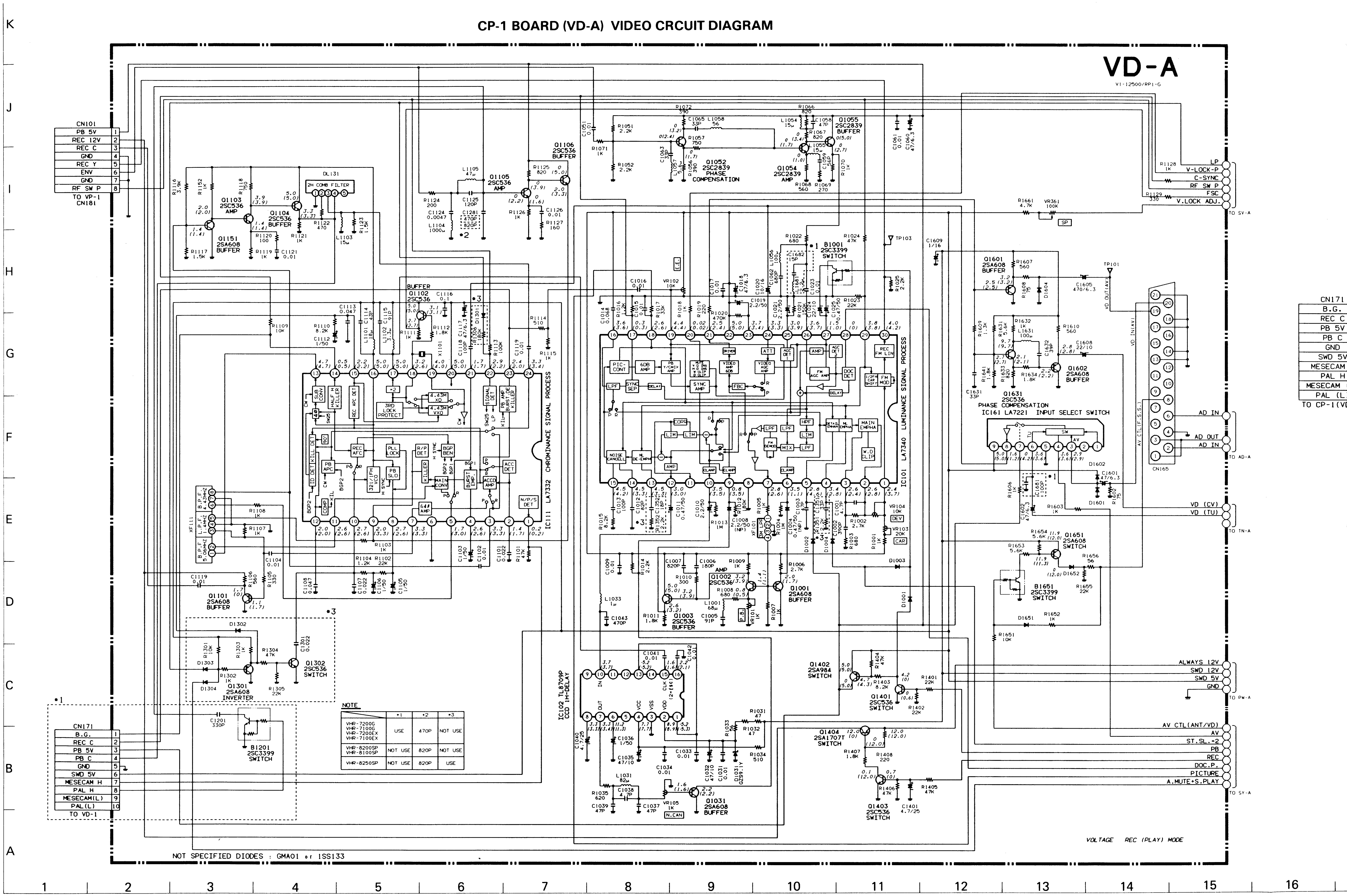
## PW-2 P.C.B.



JWA02
IC521
JCI-N1S
PW-2 1AC4B11A17500B
1
10

9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

# CP-1 BOARD (VD-A) VIDEO CRCUIT DIAGRAM


VD-A
VI-12500/RP1-G
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
CN101
PB 5V
REC 12V
REC C
GND
REC Y
ENV
GND
RF SW P
TO VP-1 CN181
Q1151 2SA608 BUFFER
Q1103 2SC536 AMP
Q1104 2SC536 BUFFER
DL131 2H COMB FILTER
Q1105 2SC536 AMP
Q1106 2SC536 BUFFER
Q1102 2SC536 BUFFER
IC111 LA7332 CHROMINANCE SIGNAL PROCESS
SUB CONV
HALF H KILLER
REC APC DET
3RD LOCK PROTECT
4.43M XO
4.43M VXO
SIGNAL DET
PB AMP
BURST DE KILLER
ID DET
KILL DET
PB APC
REC AFC
PLL LOCK
R/P DET
BGP BEN
KILLER
MAIN CONV
BURST EMP.
ACCD AMP
ACC DET
N/P/S DET
321/1FH VCO
PB SLD
6dB AMP
COMP
XF111
B.P.F. 4.43MHz
L.P.F. 1.4MHz
B.P.F. 5.06MHz
Q1101 2SA608 BUFFER
Q1301 2SA608 INVERTER
Q1302 2SC536 SWITCH
B1201 2SC3399 SWITCH
CN171
B.G.
REC C
PB 5V
PB C
GND
SWD 5V
MESECAM H
PAL H
MESECAM(L)
PAL(L)
TO VD-1
Q1052 2SC2839 PHASE COMPENSATION
Q1054 2SC2839 AMP
Q1055 2SC2839 BUFFER
B1001 2SC3399 SWITCH
IC101 LA7340 LUMINANCE SIGNAL PROCESS
PIC. CONT
6DB AMP
PB Y/C MIX AMP
VIDEO AMP 6DB
VIDEO AGC AMP
ATT
AGC DET
SYNC SEP
SYNC AMP
FBC
DELAY
FM AGC AMP
DOC DET
REC FM LIN
FM MOD
NOISE CANCEL
NL DE-EMPH
LIM
LPF
HPF
MIX
FM DEMOD
MAIN EMPHA
W.D CLIP
CLAMP
Q1002 2SC536 AMP
Q1001 2SA608 BUFFER
Q1003 2SC536 BUFFER
IC102 TL8709P CCD 1H-DELAY
Q1031 2SA608 BUFFER
N.CAN
DEV
CAR
Q1601 2SA608 BUFFER
Q1631 2SC536 PHASE COMPENSATION
Q1602 2SA608 BUFFER
IC161 LA7221 INPUT SELECT SWITCH
Q1651 2SA608 SWITCH
B1651 2SC3399 SWITCH
CN165
Q1402 2SA984 SWITCH
Q1401 2SC536 SWITCH
Q1404 2SA1707T SWITCH
Q1403 2SC536 SWITCH
TP101
TP103
LP
V-LOCK-P
C-SYNC
RF SW P
FSC
V.LOCK ADJ.
TO SV-A
AD IN
AD OUT
AD IN
TO AD-A
VD (CV)
VD (TU)
TO TN-A
ALWAYS 12V
SWD 12V
SWD 5V
GND
TO PW-A
AV CTL(ANT/VD)
AV
ST.SL.-2
PB
REC
DOC.P.
PICTURE
A.MUTE+S.PLAY
TO SY-A
CN171
B.G.
REC C
PB 5V
PB C
GND
SWD 5V
MESECAM
PAL H
MESECAM
PAL (L
TO CP-1(VD

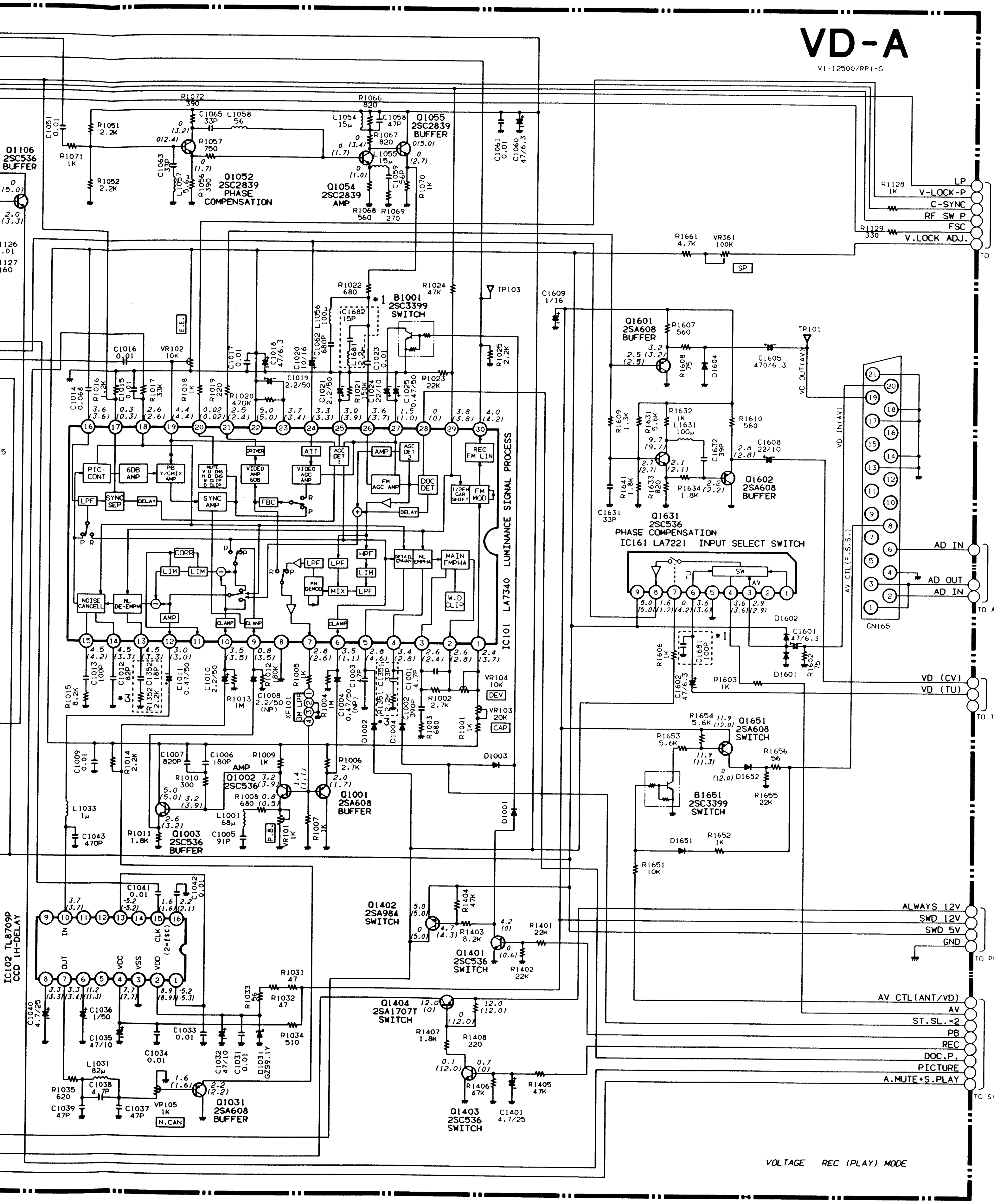
NOTE

| | •1 | •2 | •3 |
|---|---|---|---|
| VHR-7200G<br>VHR-7100G<br>VHR-7200EX<br>VHR-7100EX | USE | 470P | NOT USE |
| VHR-8200SP<br>VHR-8100SP | NOT USE | 820P | NOT USE |
| VHR-8250SP | NOT USE | 820P | USE |

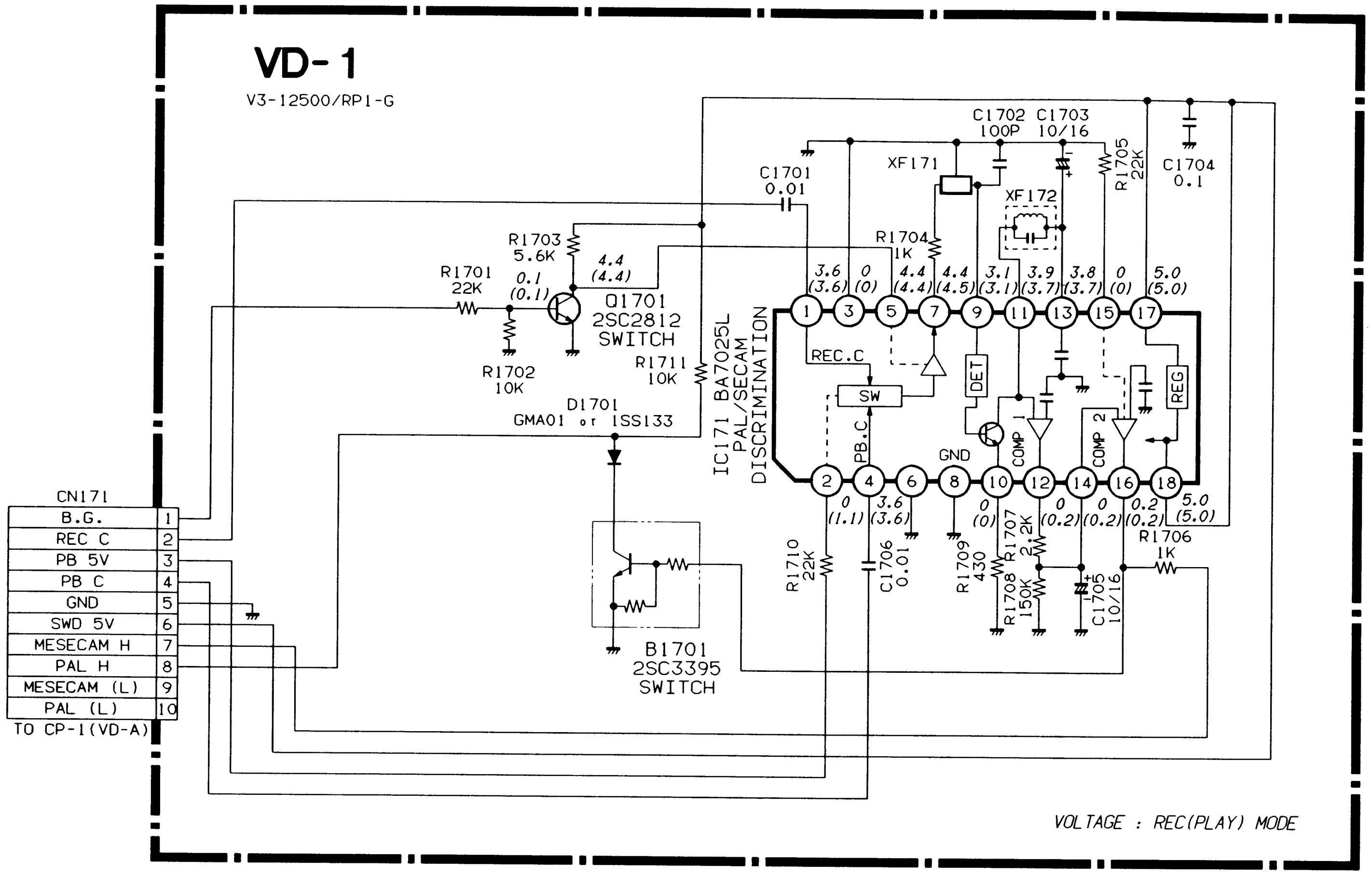
NOT SPECIFIED DIODES : GMA01 or ISS133

*VOLTAGE REC (PLAY) MODE*

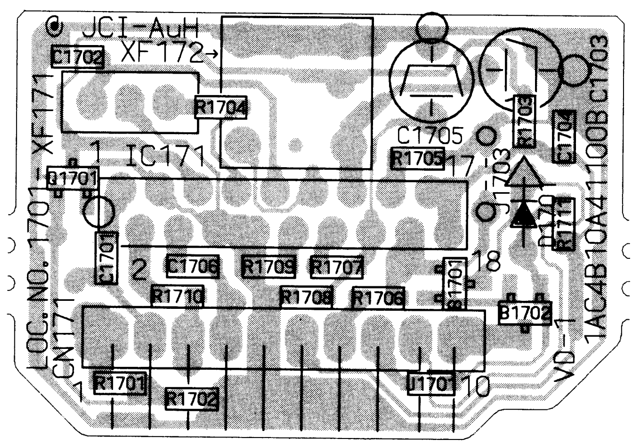
## D (VD-A) VIDEO CRCUIT DIAGRAM


VD-A
V1-12500/RP1-G
Q1106 2SC536 BUFFER
Q1052 2SC2839 PHASE COMPENSATION
Q1054 2SC2839 AMP
Q1055 2SC2839 BUFFER
B1001 2SC3399 SWITCH
Q1601 2SA608 BUFFER
Q1602 2SA608 BUFFER
Q1631 2SC536 PHASE COMPENSATION
IC161 LA7221 INPUT SELECT SWITCH
Q1651 2SA608 SWITCH
B1651 2SC3399 SWITCH
IC101 LA7340 LUMINANCE SIGNAL PROCESS
Q1002 2SC536 AMP
Q1001 2SA608 BUFFER
Q1003 2SC536 BUFFER
Q1402 2SA984 SWITCH
Q1401 2SC536 SWITCH
Q1404 2SA1707T SWITCH
Q1403 2SC536 SWITCH
Q1031 2SA608 BUFFER
IC102 TL8709P CCD 1H-DELAY
LP
V-LOCK-P
C-SYNC
RF SW P
FSC
V.LOCK ADJ.
TO SV-A
AD IN
AD OUT
AD IN
TO AD-A
VD (CV)
VD (TU)
TO TN-A
ALWAYS 12V
SWD 12V
SWD 5V
GND
TO PW-A
AV CTL(ANT/VD)
AV
ST.SL.×2
PB
REC
DOC.P.
PICTURE
A.MUTE+S.PLAY
TO SY-A
CN165
TP101
TP103
SP
DEV
CAR
N.CAN
P.B.
VOLTAGE REC (PLAY) MODE

## VD-1 BOARD PAL/SECAM DISCRIMINATION CIRCUIT DIAGRAM
## (VHR-7200G, EX, VHR-7100G, EX ONLY)


VD-1
V3-12500/RP1-G
CN171
1 B.G.
2 REC C
3 PB 5V
4 PB C
5 GND
6 SWD 5V
7 MESECAM H
8 PAL H
9 MESECAM (L)
10 PAL (L)
TO CP-1(VD-A)
R1701 22K
R1702 10K
R1703 5.6K
Q1701 2SC2812 SWITCH
R1711 10K
D1701 GMA01 or 1SS133
B1701 2SC3395 SWITCH
IC171 BA7025L PAL/SECAM DISCRIMINATION
C1701 0.01
C1702 100P
C1703 10/16
C1704 0.1
XF171
XF172
R1704 1K
R1705 22K
REC.C
SW
PB.C
DET
GND
COMP 1
COMP 2
REG
R1706 1K
R1707 2.2K
R1708 150K
R1709 430
R1710 22K
C1705 10/16
C1706 0.01
VOLTAGE : REC(PLAY) MODE

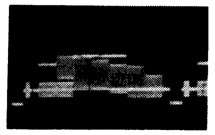
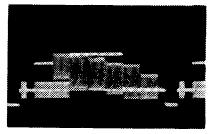
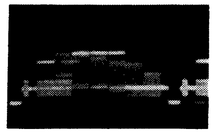
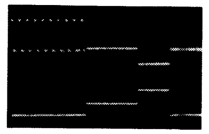
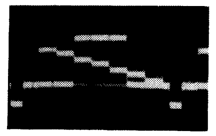
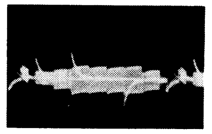
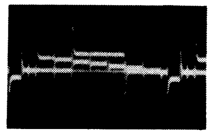
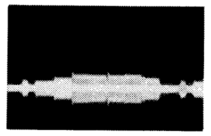
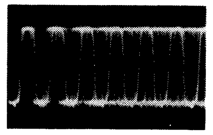
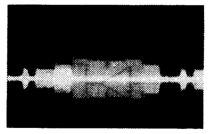
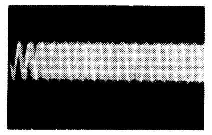
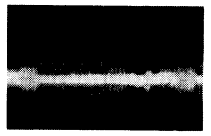
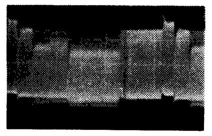
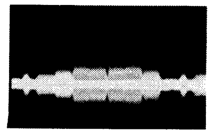
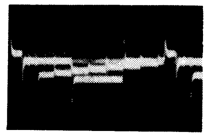
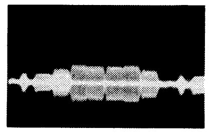
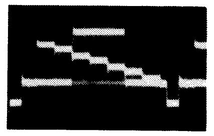
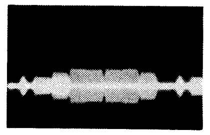
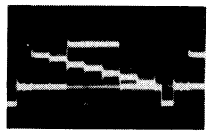
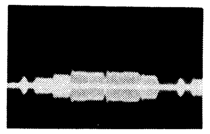
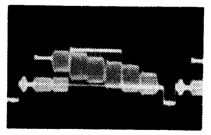
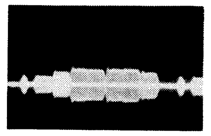
## VD-1 P.C.B.


JCI-AuH
XF172
C1702
R1704
IC171
C1705
R1705
Q1701
C1701
C1706
R1709
R1707
R1710
R1708
R1706
B1701
R1701
R1702
J1701
D1701
C1704
R1703
R1711
C1703
XF171
LOC. NO. 1701
CN171
VD-1
1AC4B10A41100B

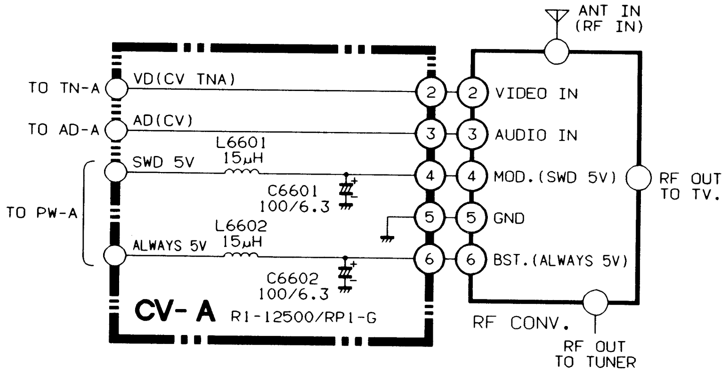
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

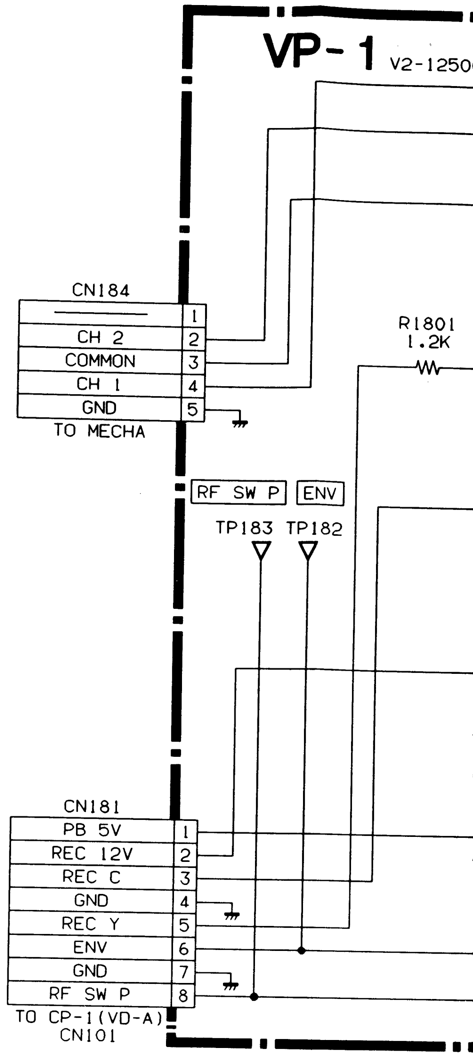
## WAVEFORM OF VIDEO CIRCUIT

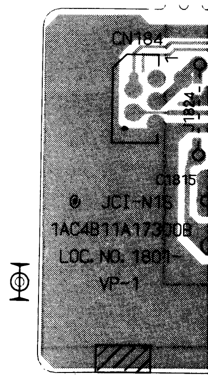
WF-V5

| TEST LOCATION | WAVEFORM | MODE/LEVEL | TEST LOCATION | WAVEFORM | MODE/LEVEL |
|---|---|---|---|---|---|
| IC101<br>Pin 24 |  | REC, EE<br>1 Vp-p | IC101<br>Pin 21 |  | REC, EE<br>2 Vp-p |
| IC101<br>Pin 7 |  | REC, EE<br>1 Vp-p | IC101<br>(UPPER)<br>Pin 21<br>(LOWER)<br>Pin 20 |  | STILL<br>(UPPER)<br>2 Vp-p<br>(LOWER)<br>5 Vp-p |
| IC101<br>Pin 6 |  | REC, EE<br>0.45 Vp-p | IC111<br>Pin 21 |  | REC, EE<br>1 Vp-p |
| IC101<br>Pin 2 |  | REC, EE<br>1.3 Vp-p | IC111<br>Pin 3 |  | REC, EE<br>0.14 Vp-p |
| IC101<br>Pin 30 |  | REC, EE<br>1.5 Vp-p | IC111<br>Pin 9 |  | REC, EE<br>0.8Vp-p |
| IC101<br>Pin 26 |  | PB<br>0.3 Vp-p | Q1105<br>Base |  | PB<br>0.1 Vp-p |
| IC101<br>Pin 7 |  | PB<br>2.0 Vp-p | Q1106<br>Emitter |  | PB<br>0.8 Vp-p |
| Q1002<br>Base |  | PB<br>0.5 Vp-p | IC111<br>Pin 7 |  | PB<br>0.3 Vp-p |
| IC101<br>Pin 9 |  | PB<br>0.6 Vp-p | IC111<br>Pin 5 |  | PB<br>1.2 Vp-p |
| IC101<br>Pins 10/12 |  | PB<br>0.5 Vp-p | IC111<br>Pin 24 |  | PB<br>0.24 Vp-p |
| IC101<br>Pin 21 |  | PB<br>2 Vp-p | IC111<br>Pin 23 |  | PB<br>0.7 Vp-p |

## CP-1 BOARD (CV-A) RF CONVERTER CONNECTION CIRCUIT DIAGRAM

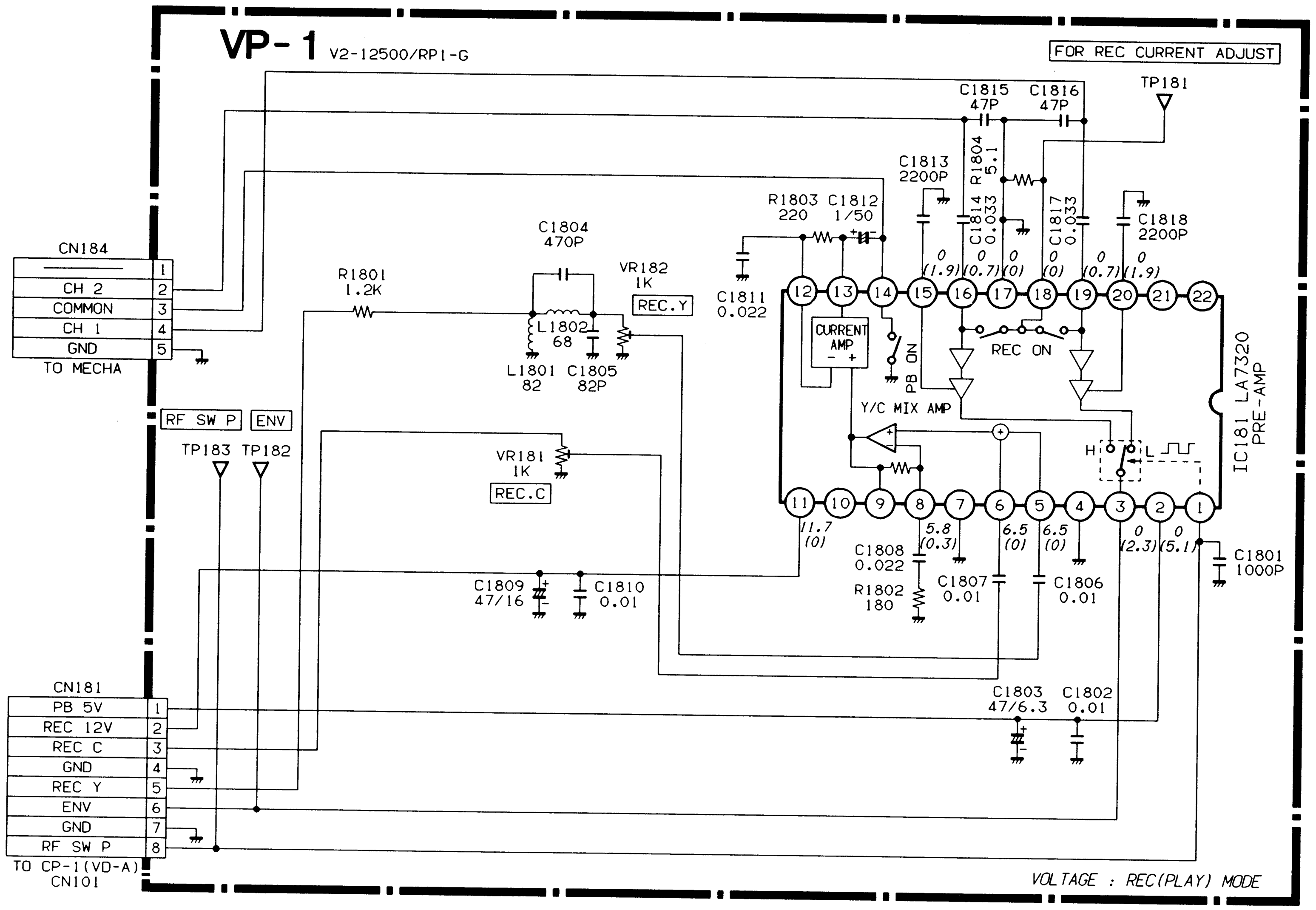

ANT IN
(RF IN)
TO TN-A
TO AD-A
TO PW-A
VD(CV TNA)
AD(CV)
SWD 5V
L6601
15μH
C6601
100/6.3
L6602
15μH
ALWAYS 5V
C6602
100/6.3
CV-A
R1-12500/RP1-G
2
3
4
5
6
VIDEO IN
AUDIO IN
MOD.(SWD 5V)
GND
BST.(ALWAYS 5V)
RF OUT
TO TV.
RF CONV.
RF OUT
TO TUNER


VP-1
V2-1250
CN184
CH 2
COMMON
CH 1
GND
TO MECHA
R1801
1.2K
RF SW P
ENV
TP183
TP182
CN181
PB 5V
REC 12V
REC C
GND
REC Y
ENV
GND
RF SW P
TO CP-1(VD-A)
CN101

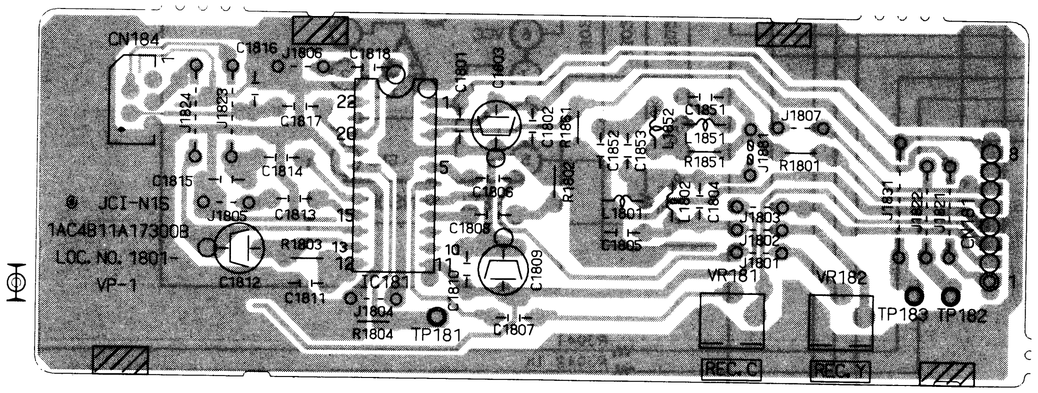

CN184
JCI-N1
1AC4B11A173
LOC. NO. 180
VP-1

| DE/LEVEL |
|---|
| C, EE<br>p-p |
| LL<br>PER)<br>p-p<br>WER)<br>p-p |
| C, EE<br>p-p |
| C, EE<br>Vp-p |
| C, EE<br>Vp-p |
| Vp-p |
| Vp-p |
| Vp-p |
| Vp-p |
| Vp-p |
| p-p |

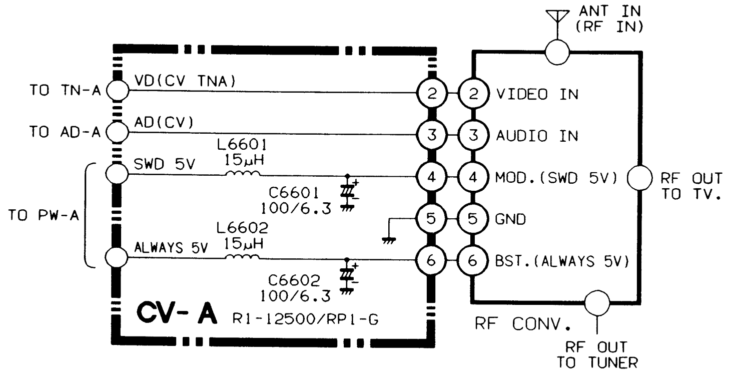
## VP-1 BOARD VIDEO PRE-AMP CIRCUIT DIAGRAM


VP-1 V2-12500/RP1-G
FOR REC CURRENT ADJUST
CN184
CH 2
COMMON
CH 1
GND
TO MECHA
CN181
PB 5V
REC 12V
REC C
GND
REC Y
ENV
GND
RF SW P
TO CP-1(VD-A) CN101
RF SW P
ENV
TP183
TP182
TP181
C1815 47P
C1816 47P
C1813 2200P
R1804 5.1
C1814 0.033
C1817 0.033
C1818 2200P
R1803 220
C1812 1/50
C1811 0.022
C1804 470P
R1801 1.2K
VR182 1K
REC.Y
L1802 68
L1801 82
C1805 82P
VR181 1K
REC.C
C1809 47/16
C1810 0.01
C1808 0.022
R1802 180
C1807 0.01
C1806 0.01
C1801 1000P
C1803 47/6.3
C1802 0.01
CURRENT AMP
PB ON
REC ON
Y/C MIX AMP
IC181 LA7320 PRE-AMP
VOLTAGE : REC(PLAY) MODE

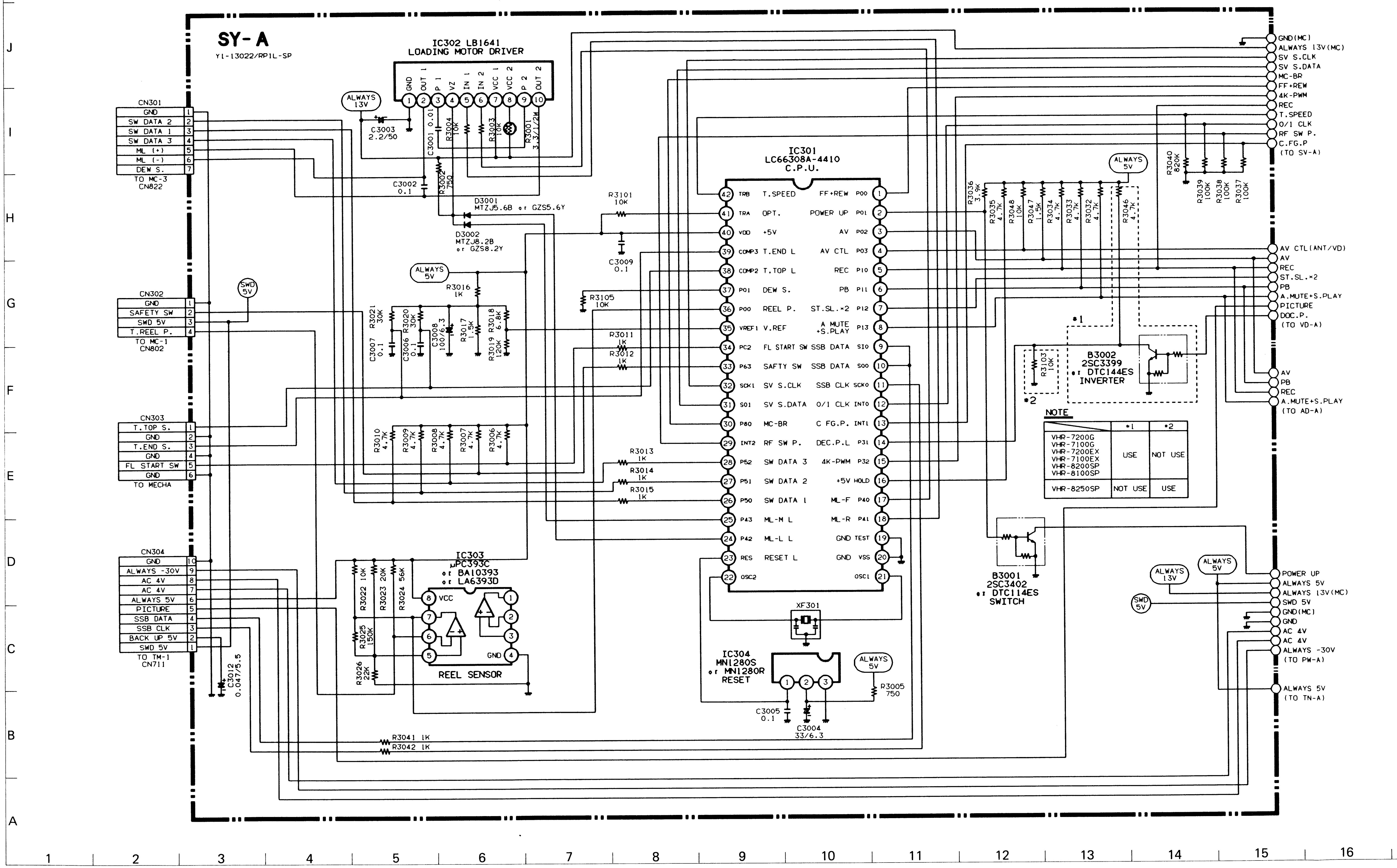
## VP-1 P.C.B.


CN184
JCI-N15
1AC4B11A17300B
LOC. NO. 1801-
VP-1
IC181
TP181
VR181
VR182
TP183
TP182
REC.C
REC.Y

## CP-1 BOARD (CV-A) RF CONVERTER CONNECTION CIRCUIT DIAGRAM


ANT IN (RF IN)
TO TN-A
TO AD-A
TO PW-A
VD(CV TNA)
AD(CV)
SWD 5V
ALWAYS 5V
L6601 15μH
L6602 15μH
C6601 100/6.3
C6602 100/6.3
VIDEO IN
AUDIO IN
MOD.(SWD 5V)
GND
BST.(ALWAYS 5V)
RF OUT TO TV.
RF CONV.
RF OUT TO TUNER
CV-A R1-12500/RP1-G

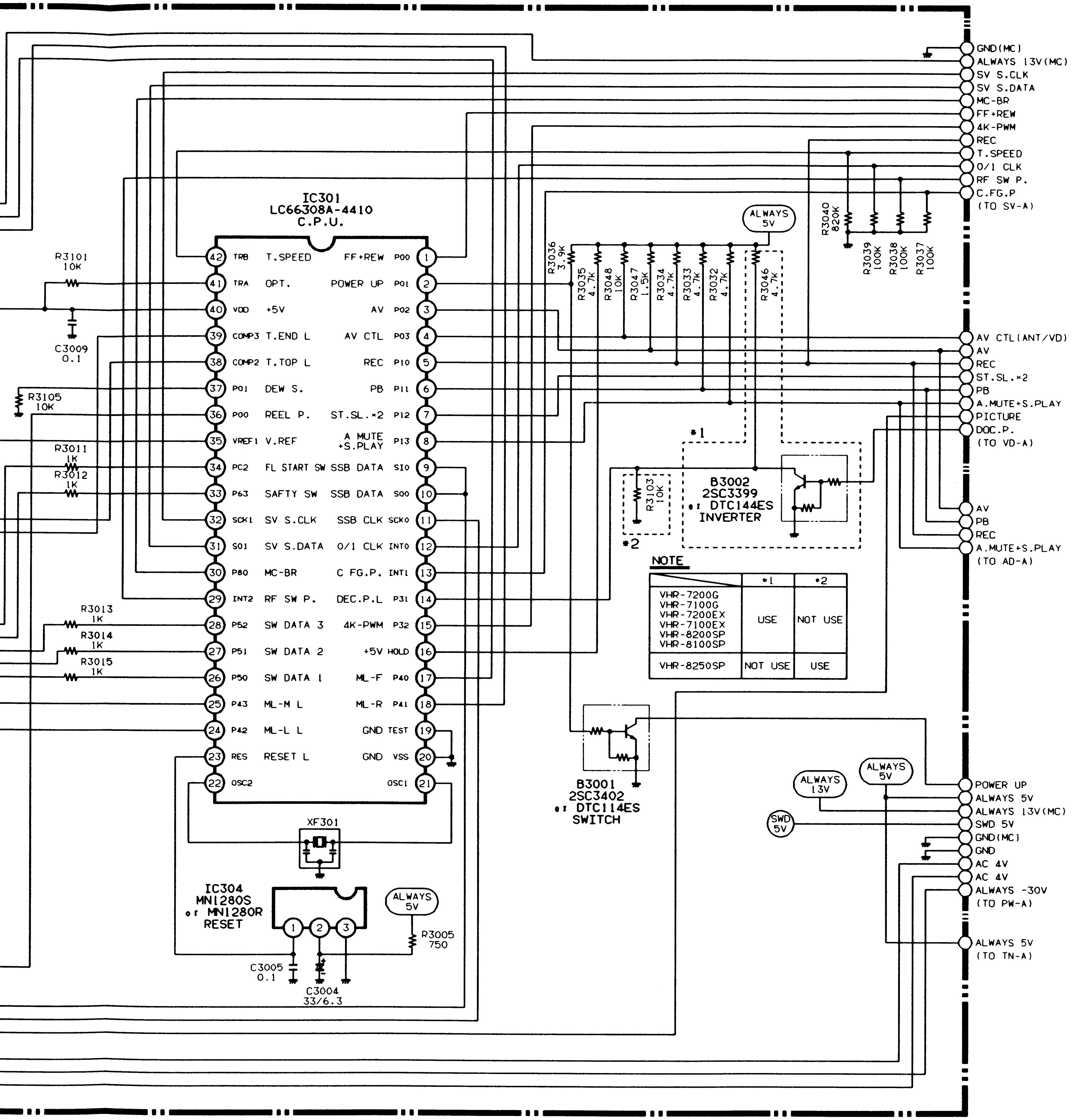
# CP-1 BOARD (SY-A) SYSTEM CONTROL CIRCUIT DIAGRAM


SY-A
Y1-13022/RP1L-SP
IC302 LB1641
LOADING MOTOR DRIVER
GND
OUT 1
P 1
VZ
IN 1
IN 2
VCC 1
VCC 2
P 2
OUT 2
ALWAYS 13V
C3003 2.2/50
C3001 0.01
R3004 10K
R3003 10K
R3001 3.3/1/2W
C3002 0.1
R3002 750
D3001 MTZJ5.6B or GZS5.6Y
D3002 MTZJ8.2B or GZS8.2Y
CN301
GND
SW DATA 2
SW DATA 1
SW DATA 3
ML (+)
ML (-)
DEW S.
TO MC-3 CN822
CN302
GND
SAFETY SW
SWD 5V
T.REEL P.
TO MC-1 CN802
SWD 5V
CN303
T.TOP S.
GND
T.END S.
GND
FL START SW
GND
TO MECHA
CN304
GND
ALWAYS -30V
AC 4V
AC 4V
ALWAYS 5V
PICTURE
SSB DATA
SSB CLK
BACK UP 5V
SWD 5V
TO TM-1 CN711
C3012 0.047/5.5
ALWAYS 5V
R3016 1K
R3021 30K
R3020 30K
C3008 100/6.3
R3017 1.5K
R3018 6.8K
R3019 120K
C3007 0.1
C3006 0.1
R3010 4.7K
R3009 4.7K
R3008 4.7K
R3007 4.7K
R3006 4.7K
IC303
μPC393C
or BA10393
or LA6393D
VCC
GND
REEL SENSOR
R3022 10K
R3023 20K
R3024 56K
R3025 150K
R3026 22K
R3101 10K
C3009 0.1
R3105 10K
R3011 1K
R3012 1K
R3013 1K
R3014 1K
R3015 1K
R3041 1K
R3042 1K
IC301
LC66308A-4410
C.P.U.
42 TRB T.SPEED
41 TRA OPT.
40 VDD +5V
39 COMP3 T.END L
38 COMP2 T.TOP L
37 P01 DEW S.
36 P00 REEL P.
35 VREF1 V.REF
34 PC2 FL START SW
33 P63 SAFTY SW
32 SCK1 SV S.CLK
31 S01 SV S.DATA
30 P80 MC-BR
29 INT2 RF SW P.
28 P52 SW DATA 3
27 P51 SW DATA 2
26 P50 SW DATA 1
25 P43 ML-M L
24 P42 ML-L L
23 RES RESET L
22 OSC2
FF+REW P00 1
POWER UP P01 2
AV P02 3
AV CTL P03 4
REC P10 5
PB P11 6
ST.SL.×2 P12 7
A MUTE +S.PLAY P13 8
SSB DATA SI0 9
SSB DATA SO0 10
SSB CLK SCK0 11
O/1 CLK INT0 12
C FG.P. INT1 13
DEC.P.L P31 14
4K-PWM P32 15
+5V HOLD 16
ML-F P40 17
ML-R P41 18
GND TEST 19
GND VSS 20
OSC1 21
XF301
IC304
MN1280S
or MN1280R
RESET
ALWAYS 5V
R3005 750
C3005 0.1
C3004 33/6.3
ALWAYS 5V
R3036 3.9K
R3035 4.7K
R3048 10K
R3047 1.5K
R3034 4.7K
R3033 4.7K
R3032 4.7K
R3046 4.7K
R3040 820K
R3039 100K
R3038 100K
R3037 100K
*1
*2
R3103 10K
B3002
2SC3399
or DTC144ES
INVERTER
B3001
2SC3402
or DTC114ES
SWITCH
GND(MC)
ALWAYS 13V(MC)
SV S.CLK
SV S.DATA
MC-BR
FF+REW
4K-PWM
REC
T.SPEED
O/1 CLK
RF SW P.
C.FG.P
(TO SV-A)
AV CTL(ANT/VD)
AV
REC
ST.SL.×2
PB
A.MUTE+S.PLAY
PICTURE
DOC.P.
(TO VD-A)
AV
PB
REC
A.MUTE+S.PLAY
(TO AD-A)
ALWAYS 13V
ALWAYS 5V
SWD 5V
POWER UP
ALWAYS 5V
ALWAYS 13V(MC)
SWD 5V
GND(MC)
GND
AC 4V
AC 4V
ALWAYS -30V
(TO PW-A)
ALWAYS 5V
(TO TN-A)
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

NOTE

| | *1 | *2 |
|---|---|---|
| VHR-7200G<br>VHR-7100G<br>VHR-7200EX<br>VHR-7100EX<br>VHR-8200SP<br>VHR-8100SP | USE | NOT USE |
| VHR-8250SP | NOT USE | USE |

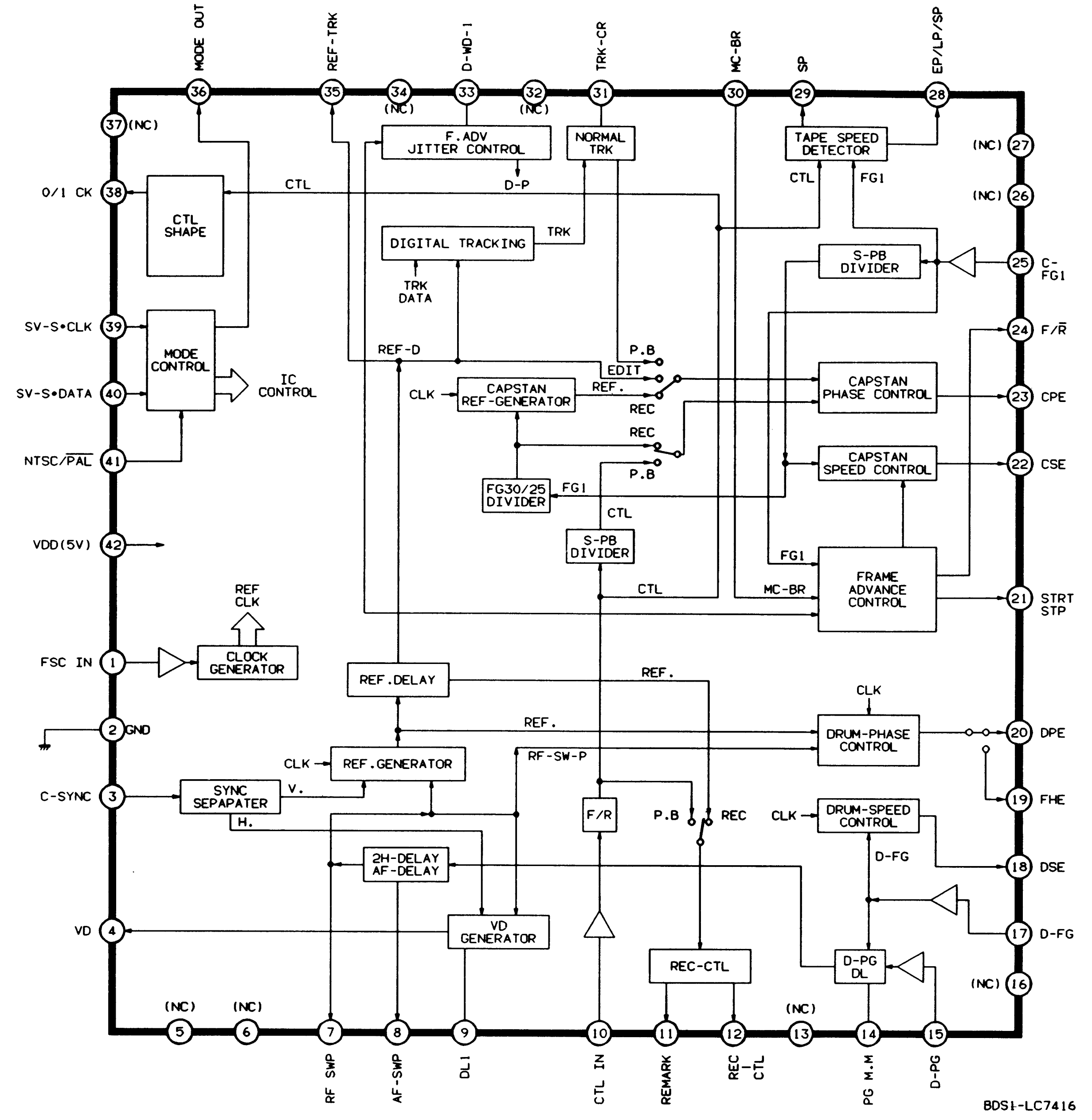
## P-1 BOARD (SY-A) SYSTEM CONTROL CIRCUIT DIAGRAM


IC301
LC66308A-4410
C.P.U.
TRB T.SPEED 42
TRA OPT. 41
VDD +5V 40
COMP3 T.END L 39
COMP2 T.TOP L 38
P01 DEW S. 37
P00 REEL P. 36
VREF1 V.REF 35
PC2 FL START SW 34
P63 SAFTY SW 33
SCK1 SV S.CLK 32
S01 SV S.DATA 31
P80 MC-BR 30
INT2 RF SW P. 29
P52 SW DATA 3 28
P51 SW DATA 2 27
P50 SW DATA 1 26
P43 ML-M L 25
P42 ML-L L 24
RES RESET L 23
OSC2 22
1 FF+REW P00
2 POWER UP P01
3 AV P02
4 AV CTL P03
5 REC P10
6 PB P11
7 ST.SL.×2 P12
8 A MUTE +S.PLAY P13
9 SSB DATA SI0
10 SSB DATA S00
11 SSB CLK SCK0
12 0/1 CLK INT0
13 C FG.P. INT1
14 DEC.P.L P31
15 4K-PWM P32
16 +5V HOLD
17 ML-F P40
18 ML-R P41
19 GND TEST
20 GND VSS
21 OSC1
R3101 10K
C3009 0.1
R3105 10K
R3011 1K
R3012 1K
R3013 1K
R3014 1K
R3015 1K
XF301
IC304
MN1280S
or MN1280R
RESET
ALWAYS 5V
R3005 750
C3005 0.1
C3004 33/6.3
R3036 3.9K
R3035 4.7K
R3048 10K
R3047 1.5K
R3034 4.7K
R3033 4.7K
R3032 4.7K
R3046 4.7K
ALWAYS 5V
R3040 820K
R3039 100K
R3038 100K
R3037 100K
*1
R3103 10K
*2
B3002
2SC3399
or DTC144ES
INVERTER
B3001
2SC3402
or DTC114ES
SWITCH
ALWAYS 13V
ALWAYS 5V
SWD 5V
GND(MC)
ALWAYS 13V(MC)
SV S.CLK
SV S.DATA
MC-BR
FF+REW
4K-PWM
REC
T.SPEED
0/1 CLK
RF SW P.
C.FG.P
(TO SV-A)
AV CTL(ANT/VD)
AV
REC
ST.SL.×2
PB
A.MUTE+S.PLAY
PICTURE
DOC.P.
(TO VD-A)
AV
PB
REC
A.MUTE+S.PLAY
(TO AD-A)
POWER UP
ALWAYS 5V
ALWAYS 13V(MC)
SWD 5V
GND(MC)
GND
AC 4V
AC 4V
ALWAYS -30V
(TO PW-A)
ALWAYS 5V
(TO TN-A)

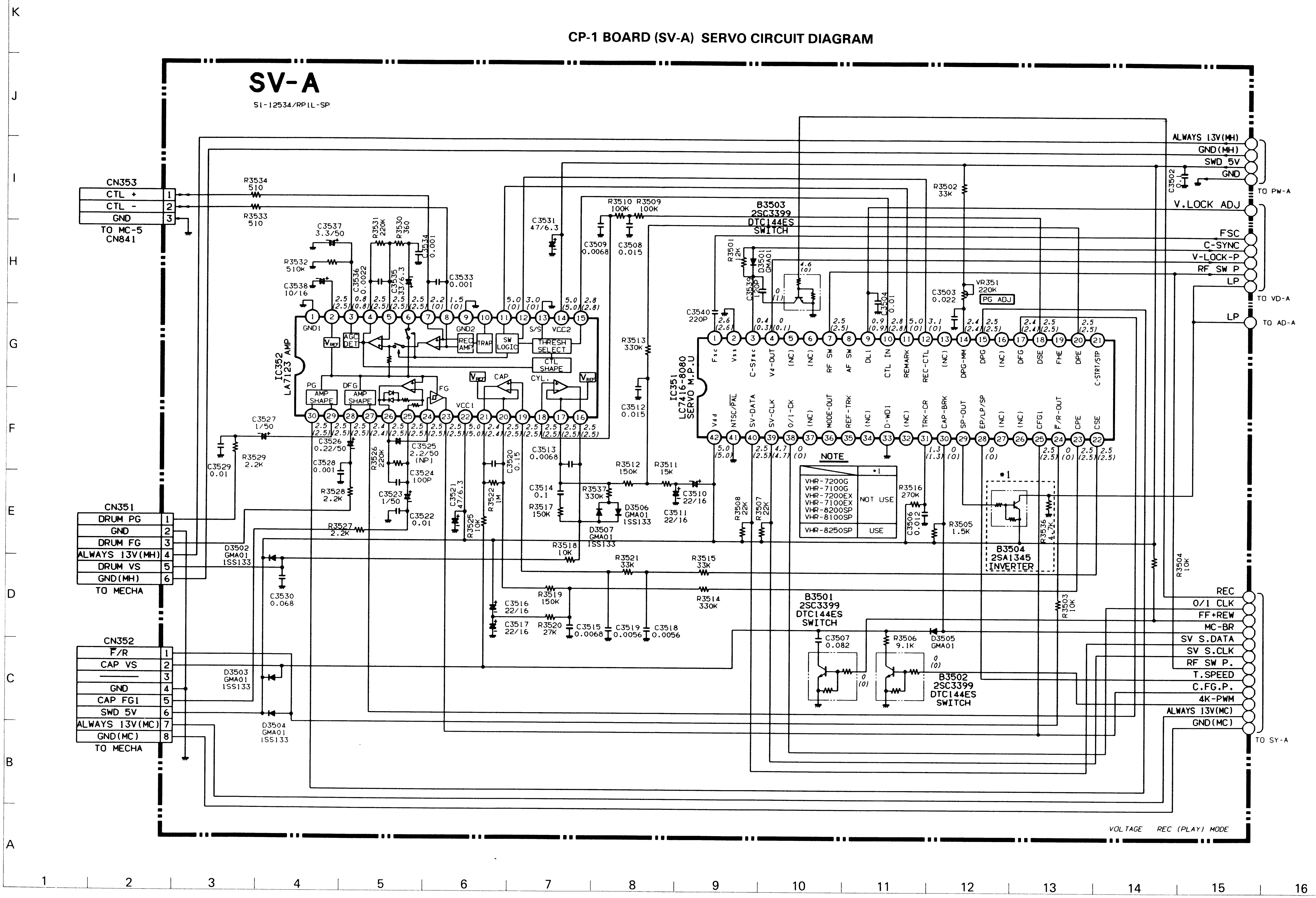
NOTE

|  | *1 | *2 |
|---|---|---|
| VHR-7200G<br>VHR-7100G<br>VHR-7200EX<br>VHR-7100EX<br>VHR-8200SP<br>VHR-8100SP | USE | NOT USE |
| VHR-8250SP | NOT USE | USE |

## IC351 (LC7416) DIGITAL SERVO IC INTER BLOCK DIAGRAM


MODE OUT 36
REF-TRK 35
34 (NC)
D-WD-1 33
32 (NC)
TRK-CR 31
MC-BR 30
SP 29
EP/LP/SP 28
37 (NC)
0/1 CK 38
SV-S•CLK 39
SV-S•DATA 40
NTSC/PAL 41
VDD(5V) 42
FSC IN 1
2 GND
C-SYNC 3
VD 4
(NC) 5
(NC) 6
RF SWP 7
AF-SWP 8
DLI 9
CTL IN 10
REMARK 11
REC-CTL 12
(NC) 13
PG M.M 14
D-PG 15
(NC) 16
17 D-FG
18 DSE
19 FHE
20 DPE
21 STRT STP
22 CSE
23 CPE
24 F/R
25 C-FG1
(NC) 26
(NC) 27
CTL SHAPE
CTL
MODE CONTROL
IC CONTROL
F.ADV JITTER CONTROL
D-P
NORMAL TRK
TAPE SPEED DETECTOR
FG1
DIGITAL TRACKING
TRK
TRK DATA
REF-D
P.B
EDIT
REF.
CLK
CAPSTAN REF-GENERATOR
REC
P.B
FG30/25 DIVIDER
S-PB DIVIDER
CAPSTAN PHASE CONTROL
CAPSTAN SPEED CONTROL
FRAME ADVANCE CONTROL
MC-BR
REF CLK
CLOCK GENERATOR
REF.DELAY
REF.
REF.GENERATOR
RF-SW-P
SYNC SEPAPATER
V.
H.
2H-DELAY AF-DELAY
VD GENERATOR
F/R
REC
REC-CTL
DRUM-PHASE CONTROL
DRUM-SPEED CONTROL
D-FG
D-PG DL
BDS1-LC7416

# CP-1 BOARD (SV-A) SERVO CIRCUIT DIAGRAM

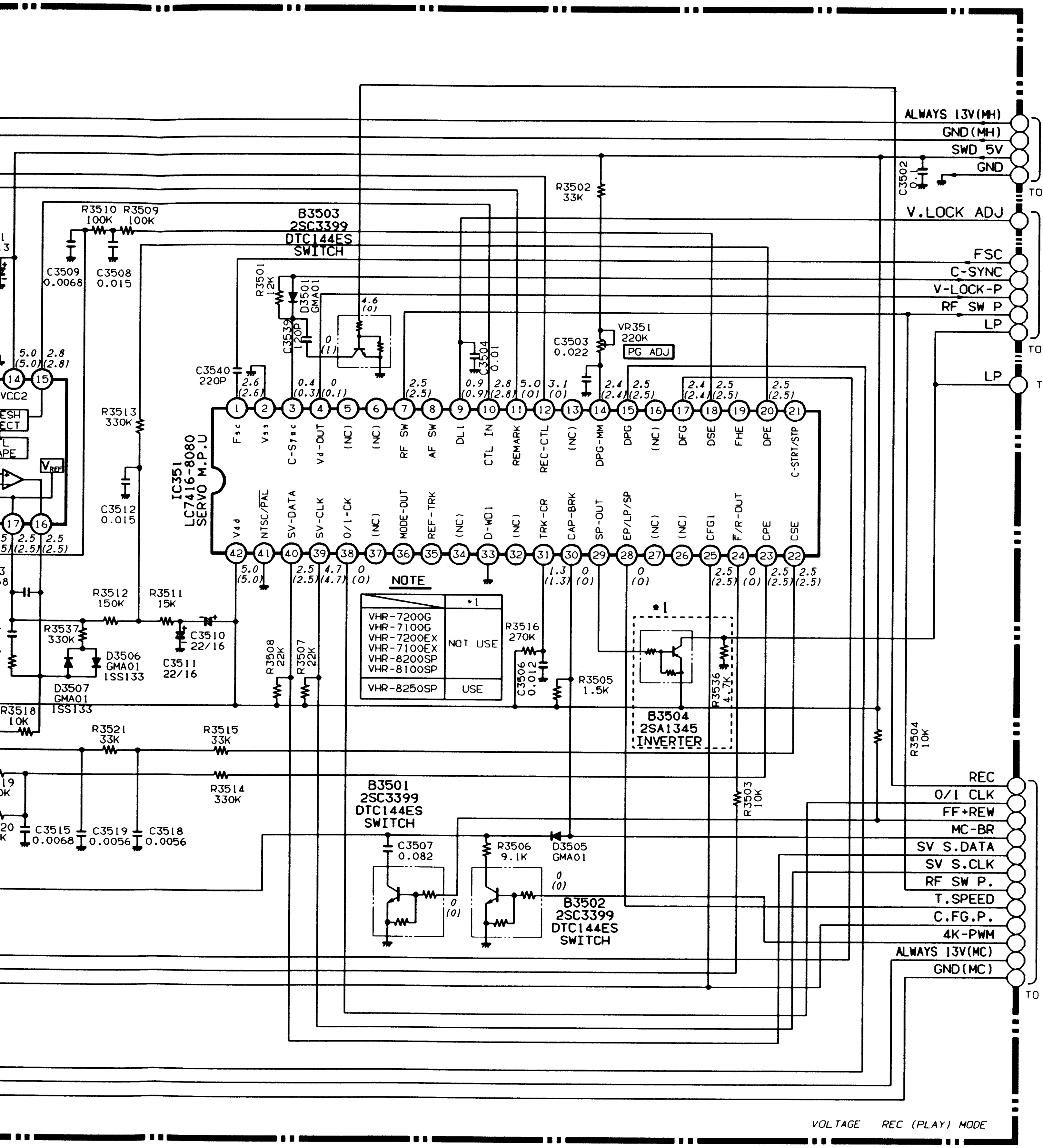

SV-A
S1-12534/RP1L-SP
CN353
CTL +
CTL -
GND
TO MC-5 CN841
CN351
DRUM PG
GND
DRUM FG
ALWAYS 13V(MH)
DRUM VS
GND(MH)
TO MECHA
CN352
F/R
CAP VS
GND
CAP FG1
SWD 5V
ALWAYS 13V(MC)
GND(MC)
TO MECHA
IC352 LA7123 AMP
IC351 LC7416-8080 SERVO M.P.U
B3503 2SC3399 DTC144ES SWITCH
B3501 2SC3399 DTC144ES SWITCH
B3502 2SC3399 DTC144ES SWITCH
B3504 2SA1345 INVERTER
D3502 GMA01 1SS133
D3503 GMA01 1SS133
D3504 GMA01 1SS133
D3505 GMA01
D3506 GMA01 1SS133
D3507 GMA01 1SS133
VR351 220K
PG ADJ
ALWAYS 13V(MH)
GND(MH)
SWD 5V
GND
TO PW-A
V.LOCK ADJ
FSC
C-SYNC
V-LOCK-P
RF SW P
LP
TO VD-A
LP
TO AD-A
REC
0/1 CLK
FF+REW
MC-BR
SV S.DATA
SV S.CLK
RF SW P.
T.SPEED
C.FG.P.
4K-PWM
ALWAYS 13V(MC)
GND(MC)
TO SY-A
VOLTAGE REC (PLAY) MODE

NOTE

|  | *1 |
|---|---|
| VHR-7200G<br>VHR-7100G<br>VHR-7200EX<br>VHR-7100EX<br>VHR-8200SP<br>VHR-8100SP | NOT USE |
| VHR-8250SP | USE |

| IC |
|---|
| ⑦ |
| ⑧ |
| ⑨ |
| ⑩ |
| ⑫ |
| ⑭ |
| ⑮ |
| ⑰ |
| ⑱ |
| ⑳ |
| ㉒ |
| ㉓ |

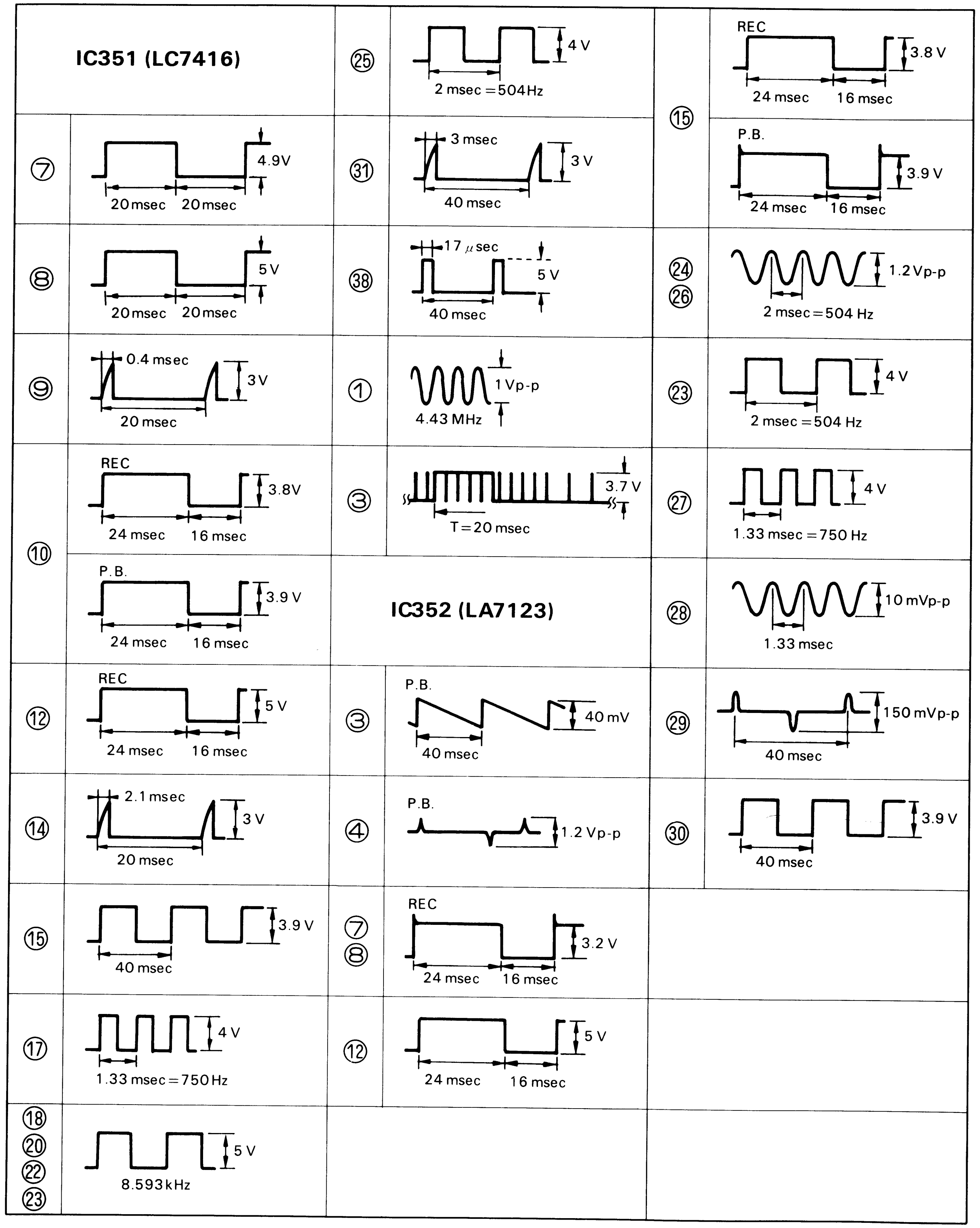
## CP-1 BOARD (SV-A) SERVO CIRCUIT DIAGRAM


IC351
LC7416-8080
SERVO M.P.U
B3503
2SC3399
DTC144ES
SWITCH
B3501
2SC3399
DTC144ES
SWITCH
B3502
2SC3399
DTC144ES
SWITCH
B3504
2SA1345
INVERTER
VR351
220K
PG ADJ
D3501
GMA01
D3505
GMA01
D3506
GMA01
1SS133
D3507
GMA01
1SS133
R3501 12K
R3502 33K
R3503 10K
R3504 10K
R3505 1.5K
R3506 9.1K
R3507 22K
R3508 22K
R3509 100K
R3510 100K
R3511 15K
R3512 150K
R3513 330K
R3514 330K
R3515 33K
R3516 270K
R3518 10K
R3521 33K
R3536 4.7K
R3537 330K
C3502 0.1
C3503 0.022
C3504 0.01
C3506 0.012
C3507 0.082
C3508 0.015
C3509 0.0068
C3510 22/16
C3511 22/16
C3512 0.015
C3515 0.0068
C3518 0.0056
C3519 0.0056
C3539 120P
C3540 220P
Fsc
Vss
C-Sync
Vd-OUT
(NC)
RF SW
AF SW
DLI
CTL IN
REMARK
REC-CTL
DPG-MM
DPG
DFG
DSE
FHE
DPE
C-STRT/STP
Vdd
NTSC/PAL
SV-DATA
SV-CLK
0/1-CK
MODE-OUT
REF-TRK
D-WD1
TRK-CR
CAP-BRK
SP-OUT
EP/LP/SP
CFG1
F/R-OUT
CPE
CSE
ALWAYS 13V(MH)
GND(MH)
SWD 5V
GND
TO PW-A
V.LOCK ADJ
FSC
C-SYNC
V-LOCK-P
RF SW P
LP
TO VD-A
LP
TO AD-A
REC
0/1 CLK
FF+REW
MC-BR
SV S.DATA
SV S.CLK
RF SW P.
T.SPEED
C.FG.P.
4K-PWM
ALWAYS 13V(MC)
GND(MC)
TO SY-A
VOLTAGE REC (PLAY) MODE

NOTE

| | *1 |
|---|---|
| VHR-7200G<br>VHR-7100G<br>VHR-7200EX<br>VHR-7100EX<br>VHR-8200SP<br>VHR-8100SP | NOT USE |
| VHR-8250SP | USE |

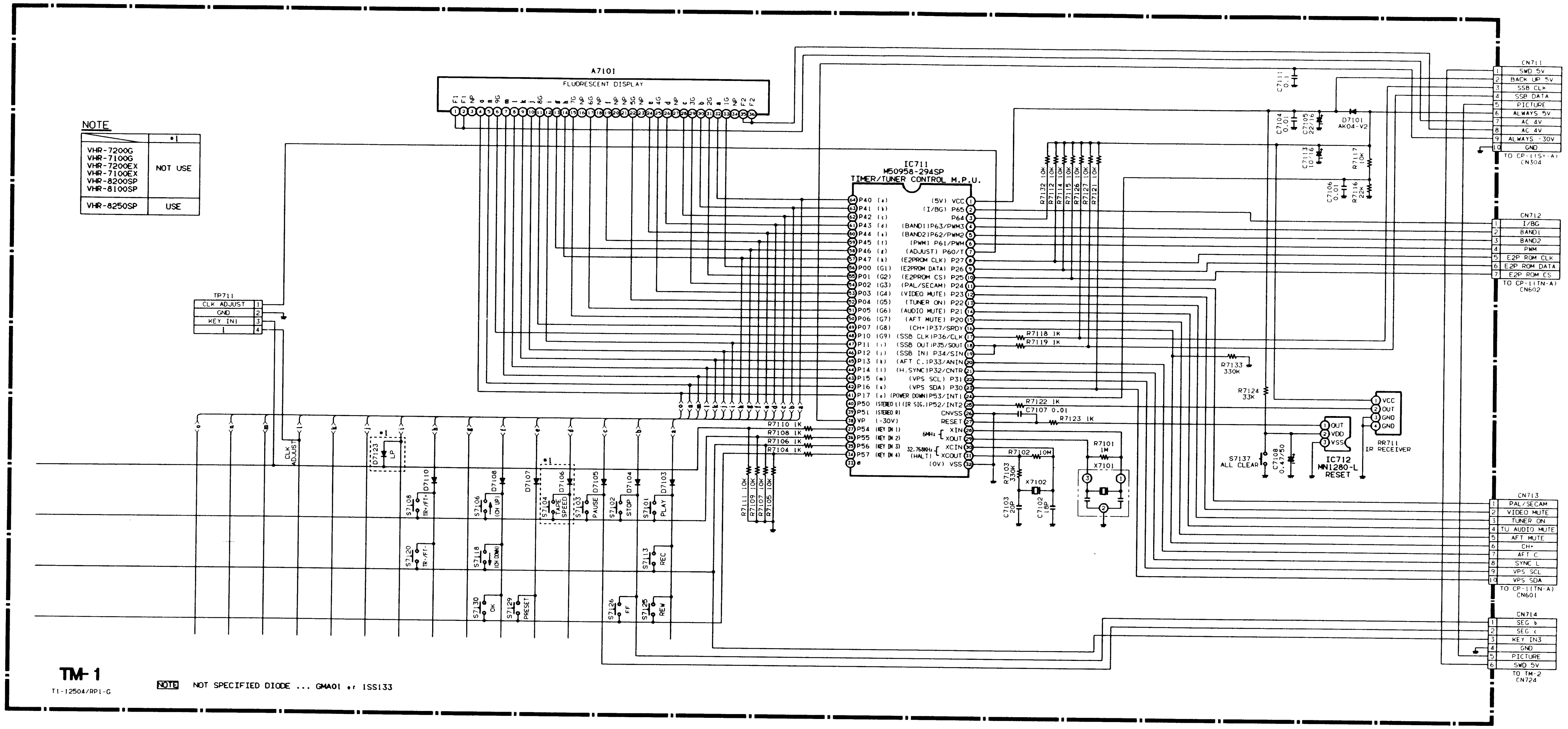
## WAVEFORM OF SERVO

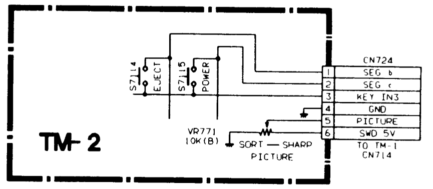

IC351 (LC7416)
⑦ 20msec 20msec 4.9V
⑧ 20msec 20msec 5V
⑨ 0.4 msec 20 msec 3V
⑩ REC 24 msec 16 msec 3.8V
P.B. 24 msec 16 msec 3.9V
⑫ REC 24 msec 16 msec 5V
⑭ 2.1 msec 20 msec 3V
⑮ 40 msec 3.9V
⑰ 1.33 msec=750Hz 4V
⑱ ⑳ ㉒ ㉓ 8.593kHz 5V
㉕ 2 msec=504Hz 4V
㉛ 3 msec 40 msec 3V
㊳ 17 μsec 40 msec 5V
① 4.43 MHz 1Vp-p
③ T=20 msec 3.7V
IC352 (LA7123)
③ P.B. 40 msec 40mV
④ P.B. 1.2 Vp-p
⑦ ⑧ REC 24 msec 16 msec 3.2V
⑫ 24 msec 16 msec 5V
⑮ REC 24 msec 16 msec 3.8V
P.B. 24 msec 16 msec 3.9V
㉔ ㉖ 2 msec=504 Hz 1.2Vp-p
㉓ 2 msec=504 Hz 4V
㉗ 1.33 msec=750 Hz 4V
㉘ 1.33 msec 10mVp-p
㉙ 40 msec 150mVp-p
㉚ 40 msec 3.9V

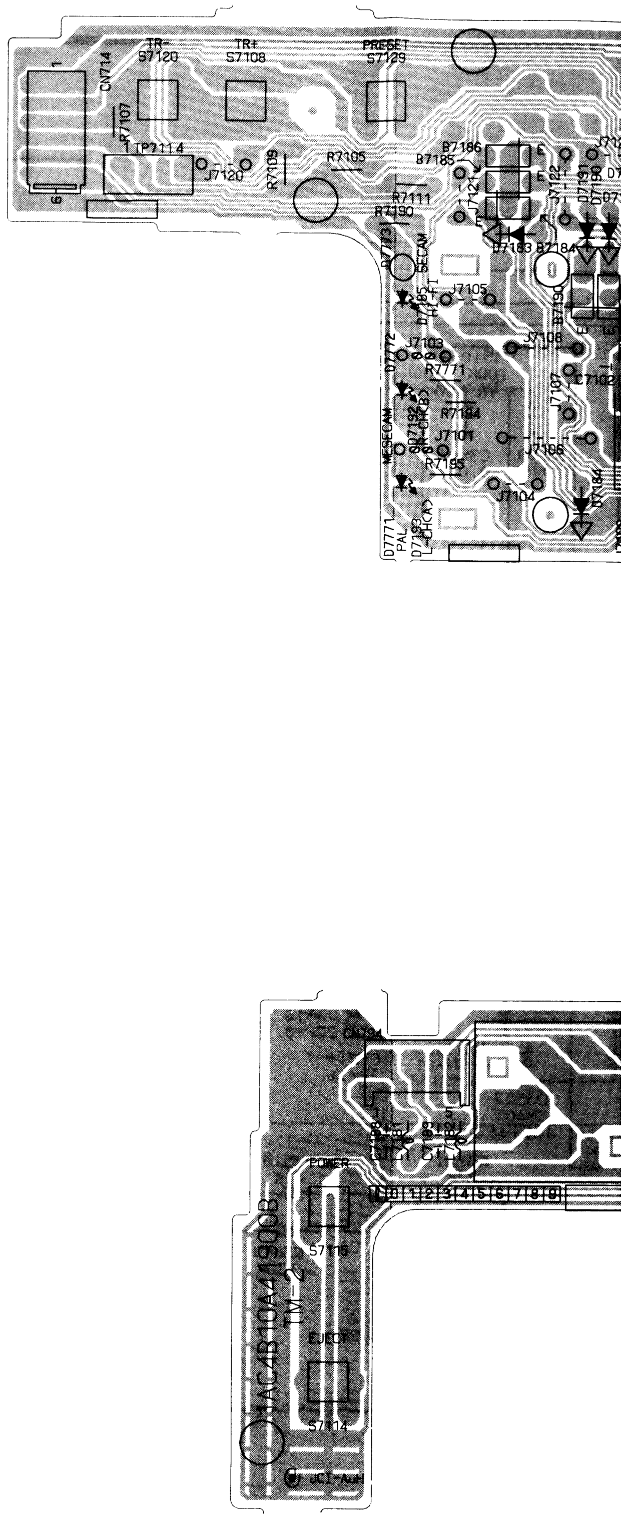
WF-S1

## TM-1 BOARD DISPLAY, TIMER & TUNING CONTROL CIRCUIT DIAGRAM

## TM-2 BOARD SWITCH & VR CIRCUIT DIAGRAM


A7101
FLUORESCENT DISPLAY
NOTE
VHR-7200G
VHR-7100G
VHR-7200EX
VHR-7100EX
VHR-8200SP
VHR-8100SP
*1
NOT USE
VHR-8250SP
USE
TP711
CLK ADJUST
GND
KEY IN1
IC711
M50958-294SP
TIMER/TUNER CONTROL M.P.U.
P40 (a)
P41 (b)
P42 (c)
P43 (d)
P44 (e)
P45 (f)
P46 (g)
P47 (h)
P00 (G1)
P01 (G2)
P02 (G3)
P03 (G4)
P04 (G5)
P05 (G6)
P06 (G7)
P07 (G8)
P10 (G9)
P11 (i)
P12 (j)
P13 (k)
P14 (l)
P15 (m)
P16 (n)
P17 (o)
P50 (STEREO L)
P51 (STEREO R)
VP (-30V)
P54 (KEY IN 1)
P55 (KEY IN 2)
P56 (KEY IN 3)
P57 (KEY IN 4)
ø
(5V) VCC
(I/BG) P65
P64
(BAND1)P63/PWM3
(BAND2)P62/PWM2
(PWM) P61/PWM
(ADJUST) P60/T
(E2PROM CLK) P27
(E2PROM DATA) P26
(E2PROM CS) P25
(PAL/SECAM) P24
(VIDEO MUTE) P23
(TUNER ON) P22
(AUDIO MUTE) P21
(AFT MUTE) P20
(CH+)P37/SRDY
(SSB CLK)P36/CLK
(SSB OUT)P35/SOUT
(SSB IN) P34/SIN
(AFT C.)P33/ANIN
(H.SYNC)P32/CNTR
(VPS SCL) P31
(VPS SDA) P30
(POWER DOWN)P53/INT1
(IR SIG.)P52/INT2
CNVSS
RESET
6MHz XIN
XOUT
32.768KHz XCIN
(HALT) XCOUT
(0V) VSS
R7110 1K
R7108 1K
R7106 1K
R7104 1K
R7118 1K
R7119 1K
R7122 1K
C7107 0.01
R7123 1K
R7133 330K
R7124 33K
R7101 1M
X7101
R7102 10M
R7103 330K
C7103 20P
X7102
C7102 18P
C7104 0.01
C7105 22/16
D7101 AK04-V2
C7113 10/16
R7117 10K
C7106 0.01
R7116 22K
R7132 10K
R7112 10K
R7114 10K
R7115 10K
R7127 10K
R7121 10K
R7111 10K
R7109 10K
R7107 10K
R7105 10K
S7137 ALL CLEAR
C7108 0.47/50
IC712 MN1280-L RESET
OUT
VDD
VSS
RR711 IR RECEIVER
VCC
OUT
GND
GND
D7123
D7110
D7108
D7107
D7106
D7105
D7104
D7103
S7108 TR-ATT
S7106 CH UP
S7104 VAR. SPEED
S7103 ...
PAUSE
STOP
S7101 PLAY
S7120 TR-AFT
S7118 CH DOWN
S7113 REC
S7130 OK
S7129 PRESET
S7126 FF
S7125 REW
CLK ADJUST
CN711
1 SWD 5V
2 BACK UP 5V
3 SSB CLK
4 SSB DATA
5 PICTURE
6 ALWAYS 5V
7 AC 4V
8 AC 4V
9 ALWAYS -30V
10 GND
TO CP-1(SY-A) CN304
CN712
1 I/BG
2 BAND1
3 BAND2
4 PWM
5 E2P ROM CLK
6 E2P ROM DATA
7 E2P ROM CS
TO CP-1(TN-A) CN602
CN713
1 PAL/SECAM
2 VIDEO MUTE
3 TUNER ON
4 TU AUDIO MUTE
5 AFT MUTE
6 CH+
7 AFT C
8 SYNC L
9 VPS SCL
10 VPS SDA
TO CP-1(TN-A) CN601
CN714
1 SEG b
2 SEG c
3 KEY IN3
4 GND
5 PICTURE
6 SWD 5V
TO TM-2 CN724
TM-1
T1-12504/RP1-G
NOTE NOT SPECIFIED DIODE ... GMA01 or 1SS133

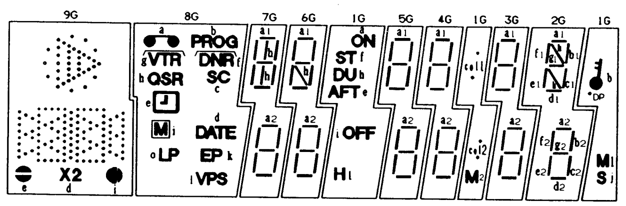

TM-2
S7114 EJECT
S7115 POWER
VR771 10K(B)
SORT — SHARP
PICTURE
CN724
1 SEG b
2 SEG c
3 KEY IN3
4 GND
5 PICTURE
6 SWD 5V
TO TM-1 CN714


CN714
TR-S7120
TR+ S7108
PRESET S7129
TP7114
R7107
R7109
J7120
R7105
R7185
R7186
R7111
R7190
J7105
J7103
R7771
J7101
R7184
R7155
J7106
J7104
J7102
D7771
CN724
POWER
S7115
EJECT
S7114
1AC4B10A41900B
TM-2

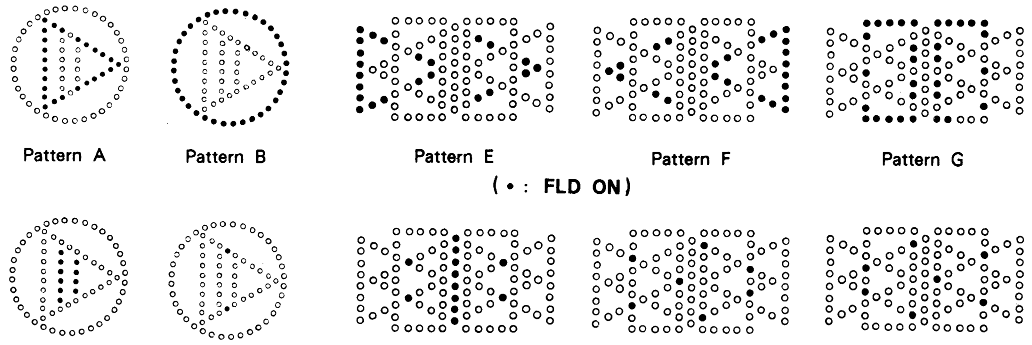
ANODE CONNECTION

|  | 9G | 8G | 7G | 6G | 5G | 4G | 3G | 2G | 1G |
|---|---|---|---|---|---|---|---|---|---|
| a | B | ●━● | a1 | a1 | a1 | a1 | a1 | a1 | ON |
| b | A | PROG. | b1 | b1 | b1 | b1 | b1 | b1 | 🌡 |
| c | - | SC | c1 | c1 | c1 | c1 | c1 | c1 | DP |
| d | ×2 | DATE | d1 | d1 | d1 | d1 | d1 | d1 | M(1) |
| e | ⊖ | ◘ | e1 | e1 | e1 | e1 | e1 | e1 | AFT |
| f | C | DNR | f1 | f1 | f1 | f1 | f1 | f1 | ST |
| g | D | VTR | g1 | g1 | g1 | g1 | g1 | g1 | col*1 |
| h | - | OSR | / | \ | - | - | - | \ | DU |
| i | ● | M | a2 | a2 | a2 | a2 | a2 | a2 | OFF |
| j | E | - | b2 | b2 | b2 | b2 | b2 | b2 | S |
| k | I | EP | c2 | c2 | c2 | c2 | c2 | c2 | - |
| l | H | VPS | d2 | d2 | d2 | d2 | d2 | d2 | H |
| m | J | - | e2 | e2 | e2 | e2 | e2 | e2 | M(2) |
| n | F | - | f2 | f2 | f2 | f2 | f2 | f2 | - |
| o | G | LP | g2 | g2 | g2 | g2 | g2 | g2 | col*2 |

GRID ASSIGNMENT


9G
8G
7G
6G
5G
4G
1G
3G
2G
1G
X2
VTR
PROG
DNR
QSR
SC
M
DATE
LP
EP
VPS
ON
ST
DU
AFT
OFF
H
M
M
S
DP

## 9G: GRAPHIC MODE DISPLAY

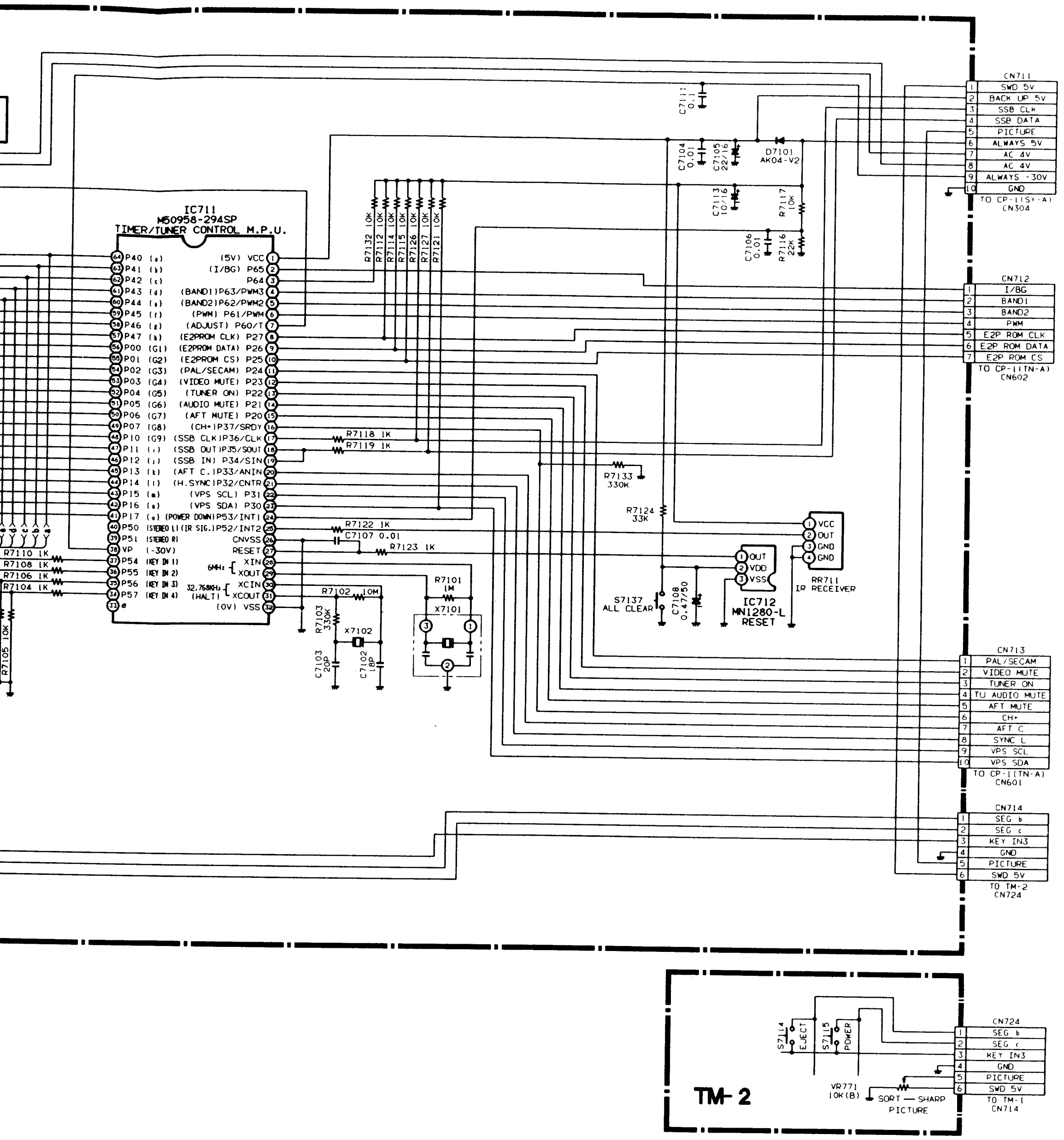


Pattern A Pattern B Pattern E Pattern F Pattern G

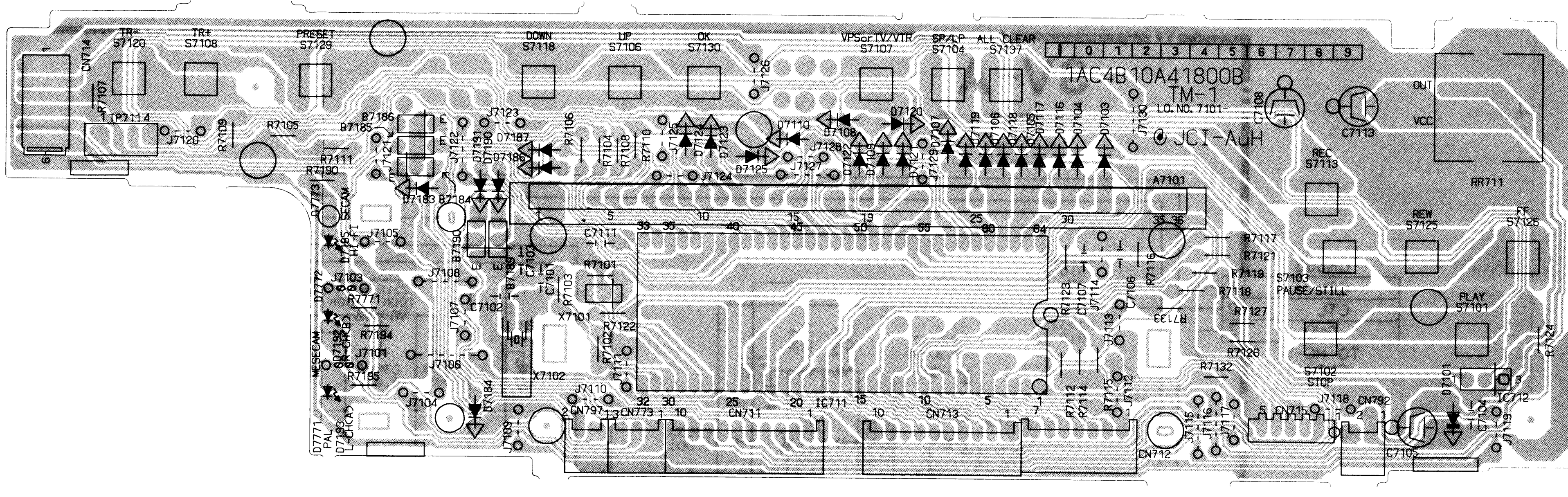
( • : FLD ON)

Pattern C Pattern D Pattern H Pattern I Pattern J

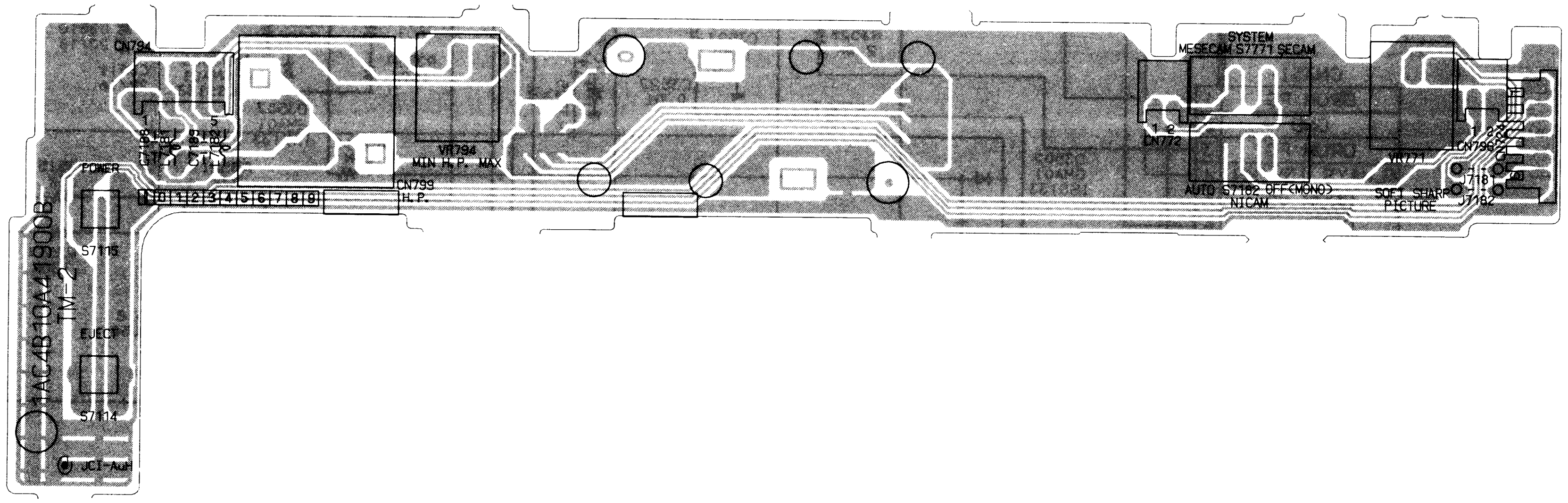
## TM-2 BOARD SWITCH & VR CIRCUIT DIAGRAM


CN711
SWD 5V
BACK UP 5V
SSB CLK
SSB DATA
PICTURE
ALWAYS 5V
AC 4V
AC 4V
ALWAYS -30V
GND
TO CP-1(SY-A) CN304
D7101 AK04-V2
IC711
M50958-294SP
TIMER/TUNER CONTROL M.P.U.
CN712
I/BG
BAND1
BAND2
PWM
E2P ROM CLK
E2P ROM DATA
E2P ROM CS
TO CP-1(TN-A) CN602
R7133 330K
R7124 33K
S7137 ALL CLEAR
IC712
MN1280-L
RESET
RR711
IR RECEIVER
X7101
X7102
CN713
PAL/SECAM
VIDEO MUTE
TUNER ON
TU AUDIO MUTE
AFT MUTE
CH+
AFT C
SYNC L
VPS SCL
VPS SDA
TO CP-1(TN-A) CN601
CN714
SEG b
SEG c
KEY IN3
GND
PICTURE
SWD 5V
TO TM-2 CN724
TM-2
S7114 EJECT
S7115 POWER
VR771 10K(B)
SOFT — SHARP
PICTURE
CN724
SEG b
SEG c
KEY IN3
GND
PICTURE
SWD 5V
TO TM-1 CN714

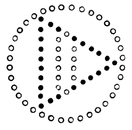
## TM-1 P.C.B.

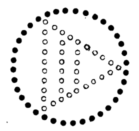

TR- S7120
TR+ S7108
PRESET S7129
DOWN S7118
UP S7106
OK S7130
VPSorTV/VTR S7107
SP/LP S7104
ALL CLEAR S7137
1AC4B10A41800B
TM-1
JCI-AuH
REC S7113
REW S7125
FF S7126
PLAY S7101
S7103 PAUSE/STILL
STOP S7102
IC711
CN711
CN712
CN713
CN773
CN797
CN792
RR711
IC712

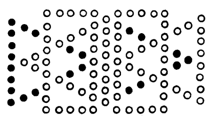
## TM-2 P.C.B.

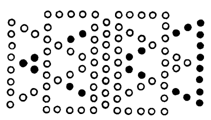

CN794
SYSTEM
MESECAM S7771 SECAM
VR794
MIN H.P. MAX
CN799
H.P.
POWER
S7115
EJECT
S7114
1AC4B10A41900B
TM-2
JCI-AuH
CN772
AUTO S7182 OFF(MONO)
NICAM
SOFT SHARP
PICTURE

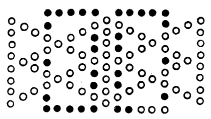
## 9G: GRAPHIC MODE DISPLAY


Pattern A

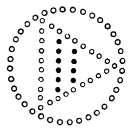

Pattern B

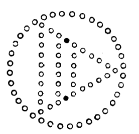

Pattern E

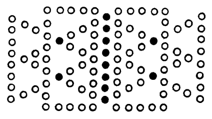

Pattern F

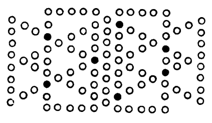

Pattern G

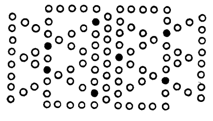
( • : FLD ON)


Pattern C

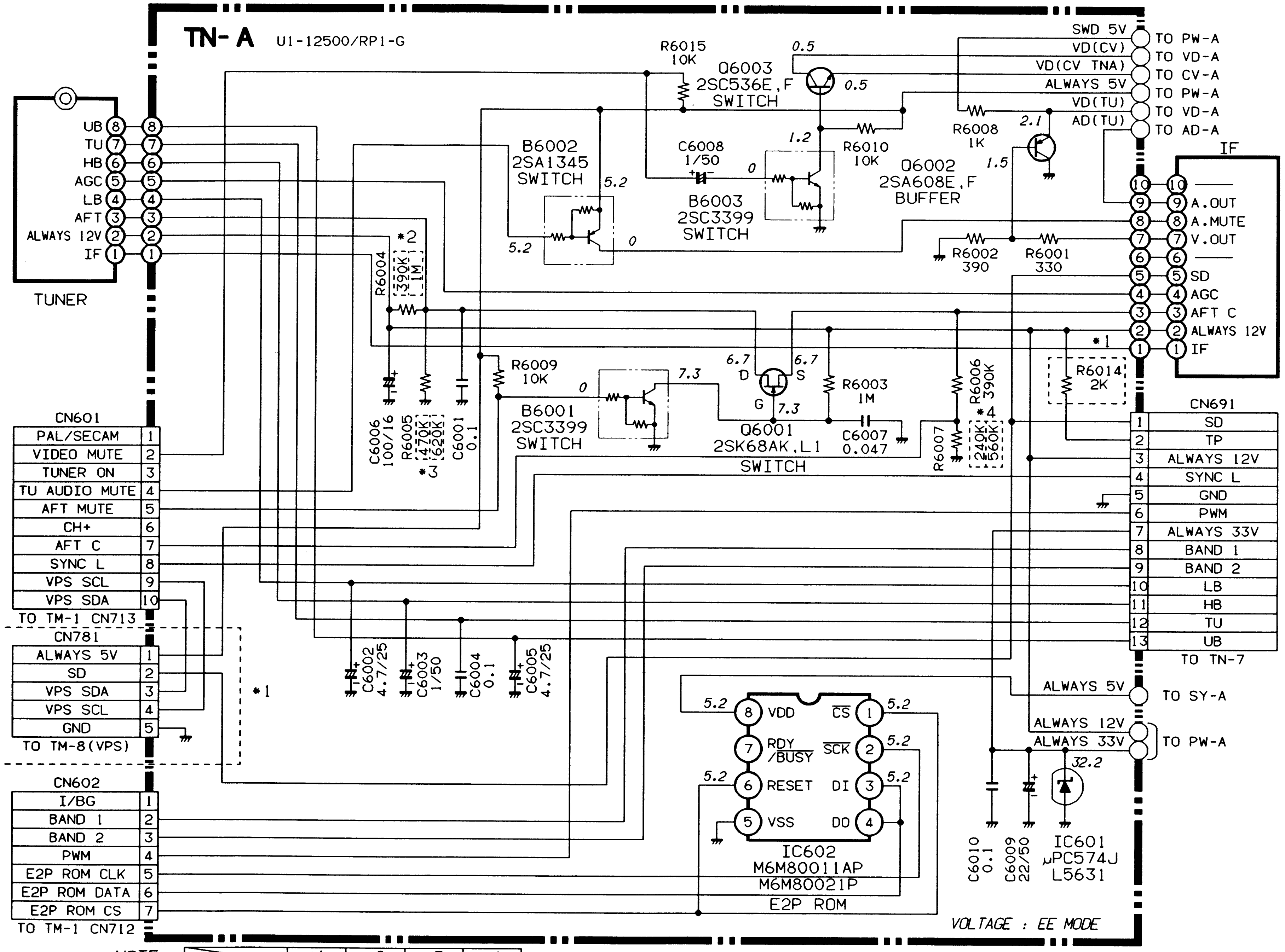

Pattern D


Pattern H


Pattern I


Pattern J

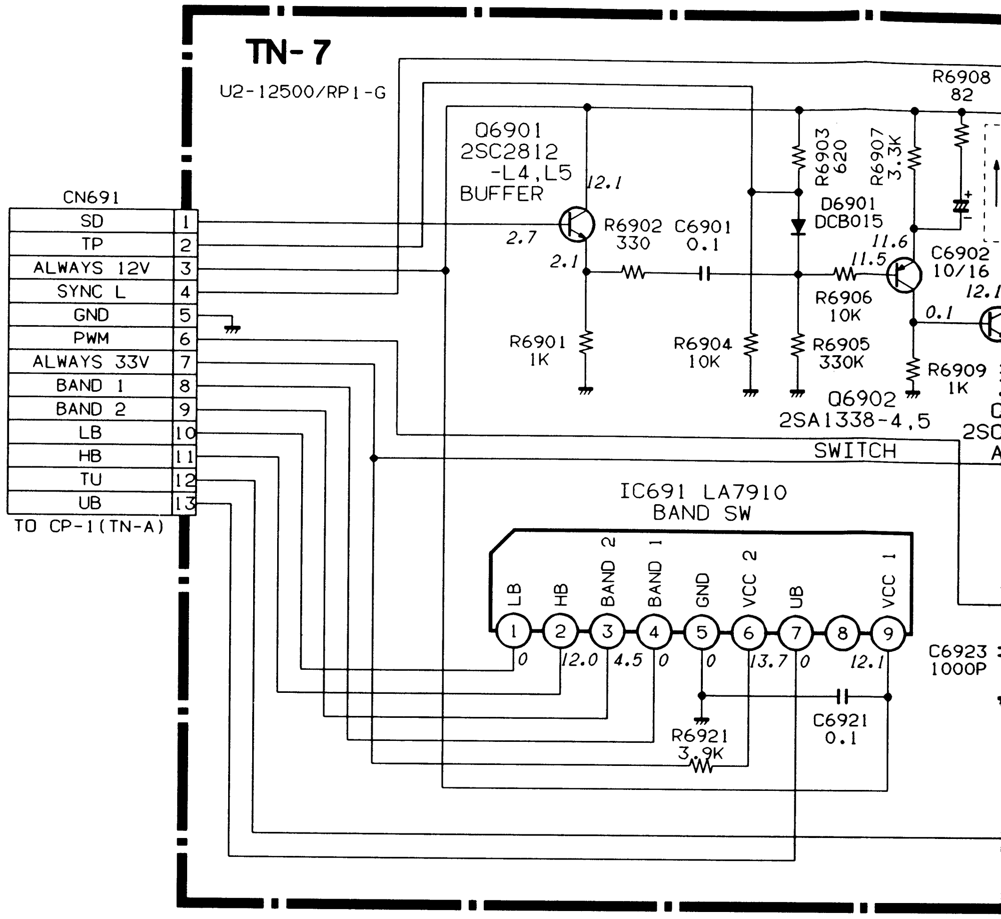
## CP-1 BOARD (TN-A) TUNER IF CONNECTION CIRCUIT DIAGRAM


TN-A
U1-12500/RP1-G
TUNER
UB
TU
HB
AGC
LB
AFT
ALWAYS 12V
IF
R6015 10K
Q6003 2SC536E,F SWITCH
0.5
B6002 2SA1345 SWITCH
5.2
C6008 1/50
B6003 2SC3399 SWITCH
1.2
R6010 10K
Q6002 2SA608E,F BUFFER
R6008 1K
2.1
1.5
R6002 390
R6001 330
R6004
*2 390K 1M
C6006 100/16
R6005 470K 620K *3
C6001 0.1
R6009 10K
B6001 2SC3399 SWITCH
7.3
6.7
D
S
G
Q6001 2SK68AK,L1 SWITCH
R6003 1M
C6007 0.047
R6007 *4 240K 560K
R6006 390K
R6014 2K *1
SWD 5V
VD(CV)
VD(CV TNA)
ALWAYS 5V
VD(TU)
AD(TU)
TO PW-A
TO VD-A
TO CV-A
TO PW-A
TO VD-A
TO AD-A
IF
A.OUT
A.MUTE
V.OUT
SD
AGC
AFT C
ALWAYS 12V
IF
CN601
PAL/SECAM
VIDEO MUTE
TUNER ON
TU AUDIO MUTE
AFT MUTE
CH+
AFT C
SYNC L
VPS SCL
VPS SDA
TO TM-1 CN713
CN781
ALWAYS 5V
SD
VPS SDA
VPS SCL
GND
TO TM-8(VPS)
*1
CN602
I/BG
BAND 1
BAND 2
PWM
E2P ROM CLK
E2P ROM DATA
E2P ROM CS
TO TM-1 CN712
C6002 4.7/25
C6003 1/50
C6004 0.1
C6005 4.7/25
CN691
SD
TP
ALWAYS 12V
SYNC L
GND
PWM
ALWAYS 33V
BAND 1
BAND 2
LB
HB
TU
UB
TO TN-7
ALWAYS 5V
TO SY-A
ALWAYS 12V
ALWAYS 33V
TO PW-A
VDD
CS
RDY /BUSY
SCK
RESET
DI
VSS
DO
IC602 M6M80011AP M6M80021P E2P ROM
C6010 0.1
C6009 22/50
IC601 μPC574J L5631
32.2
VOLTAGE : EE MODE

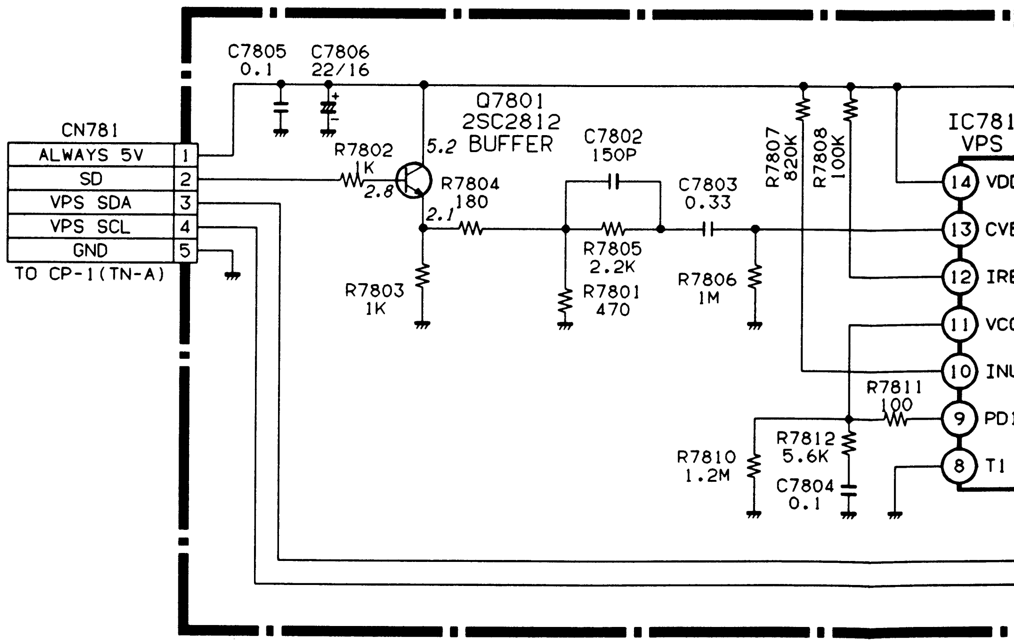
NOTE

|  | *1 | *2 | *3 | *4 |
|---|---|---|---|---|
| VHR-7200G<br>VHR-7100G | USE | 390K | 470K | 240K |
| VHR-7200EX<br>VHR-7100EX | NOT USE | 390K | 470K | 240K |
| VHR-8200SP<br>VHR-8100SP<br>VHR-8250SP | NOT USE | 1M | 620K | 560K |

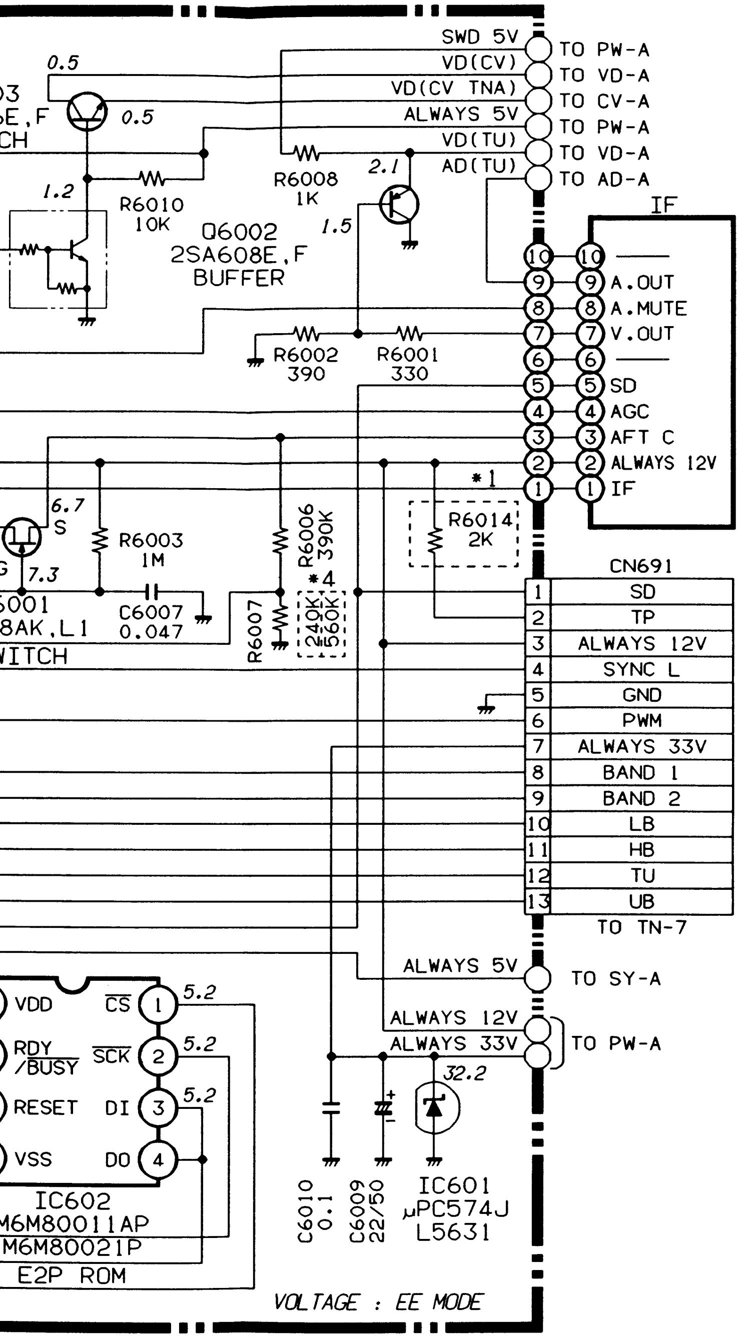
## TN-7 BOARD TUNING DET. & SYNC DET.


TN-7
U2-12500/RP1-G
Q6901 2SC2812 -L4,L5 BUFFER
R6902 330
C6901 0.1
R6901 1K
R6904 10K
R6903 620
R6907 3.3K
D6901 DCB015
R6906 10K
R6905 330K
C6902 10/16
R6908 82
R6909 1K
Q6902 2SA1338-4,5 SWITCH
12.1
2.7
2.1
11.6
11.5
0.1
CN691
SD
TP
ALWAYS 12V
SYNC L
GND
PWM
ALWAYS 33V
BAND 1
BAND 2
LB
HB
TU
UB
TO CP-1(TN-A)
IC691 LA7910 BAND SW
LB
HB
BAND 2
BAND 1
GND
VCC 2
UB
VCC 1
12.0
4.5
13.7
12.1
R6921 3.9K
C6921 0.1
C6923 1000P

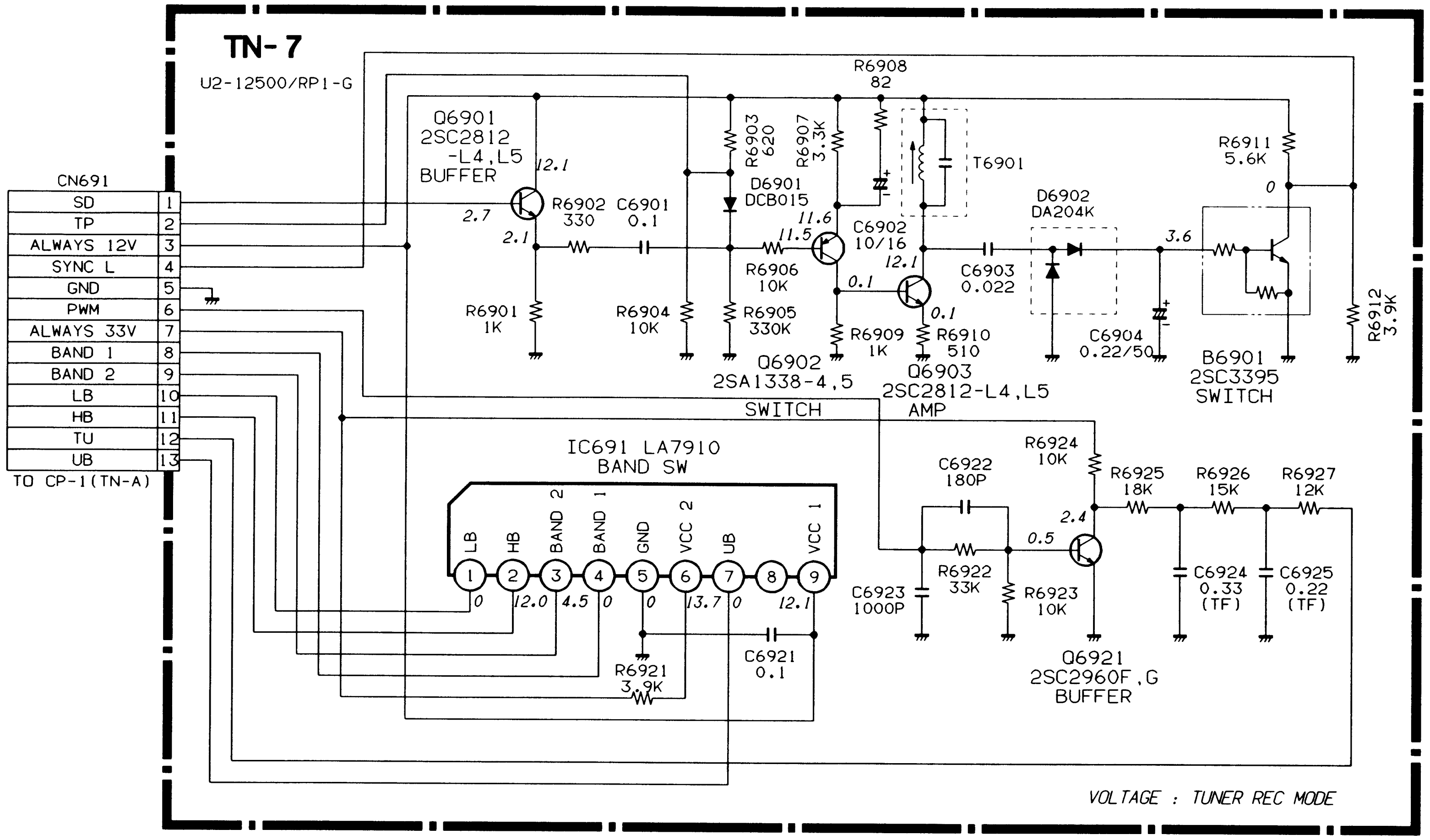
## TM-8 BOARD VPS CIRCUIT DIAGRAM (VHR-7200G, VHF


C7805 0.1
C7806 22/16
Q7801 2SC2812 BUFFER
R7802 1K
5.2
2.8
2.1
R7804 180
C7802 150P
C7803 0.33
R7807 820K
R7808 100K
R7805 2.2K
R7801 470
R7803 1K
R7806 1M
R7811 100
R7812 5.6K
R7810 1.2M
C7804 0.1
IC781
VPS
VDD
CVB
IRE
VCC
INU
PD
TI
CN781
ALWAYS 5V
SD
VPS SDA
VPS SCL
GND
TO CP-1(TN-A)

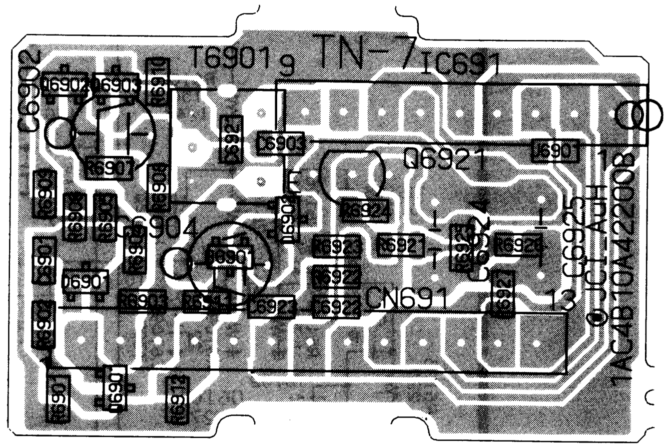
## TION CIRCUIT DIAGRAM


SWD 5V
VD(CV)
VD(CV TNA)
ALWAYS 5V
VD(TU)
AD(TU)
TO PW-A
TO VD-A
TO CV-A
TO PW-A
TO VD-A
TO AD-A
Q6002
2SA608E,F
BUFFER
R6010
10K
R6008
1K
R6002
390
R6001
330
IF
A.OUT
A.MUTE
V.OUT
SD
AGC
AFT C
ALWAYS 12V
IF
R6003
1M
C6001
0.047
C6007
R6006
390K
R6014
2K
*1
*4
CN691
SD
TP
ALWAYS 12V
SYNC L
GND
PWM
ALWAYS 33V
BAND 1
BAND 2
LB
HB
TU
UB
TO TN-7
ALWAYS 5V
TO SY-A
ALWAYS 12V
ALWAYS 33V
TO PW-A
VDD
CS
RDY/BUSY
SCK
RESET
DI
VSS
DO
IC602
M6M80011AP
M6M80021P
E2P ROM
C6010
0.1
C6009
22/50
IC601
μPC574J
L5631
VOLTAGE : EE MODE

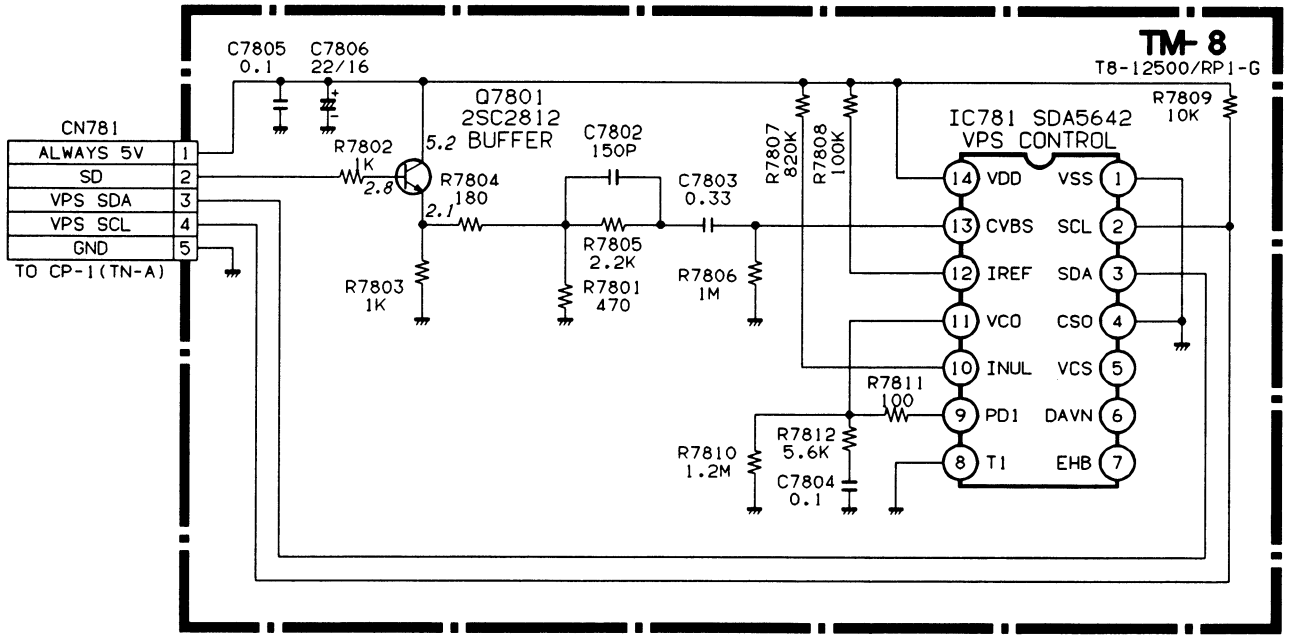
## TN-7 BOARD TUNING DET. & SYNC DET. CIRCUIT DIAGRAM


TN-7
U2-12500/RP1-G
CN691
SD
TP
ALWAYS 12V
SYNC L
GND
PWM
ALWAYS 33V
BAND 1
BAND 2
LB
HB
TU
UB
TO CP-1(TN-A)
Q6901
2SC2812
-L4,L5
BUFFER
R6902
330
C6901
0.1
R6901
1K
R6904
10K
R6903
620
R6907
3.3K
R6908
82
D6901
DCB015
R6906
10K
R6905
330K
R6909
1K
R6910
510
Q6902
2SA1338-4,5
SWITCH
Q6903
2SC2812-L4,L5
AMP
C6902
10/16
T6901
C6903
0.022
D6902
DA204K
C6904
0.22/50
R6911
5.6K
Q6901
2SC3395
SWITCH
R6912
3.9K
IC691 LA7910
BAND SW
LB
HB
BAND 2
BAND 1
GND
VCC 2
UB
VCC 1
R6921
3.9K
C6921
0.1
C6922
180P
R6922
33K
C6923
1000P
R6923
10K
R6924
10K
R6925
18K
R6926
15K
R6927
12K
C6924
0.33
(TF)
C6925
0.22
(TF)
Q6921
2SC2960F,G
BUFFER
VOLTAGE : TUNER REC MODE

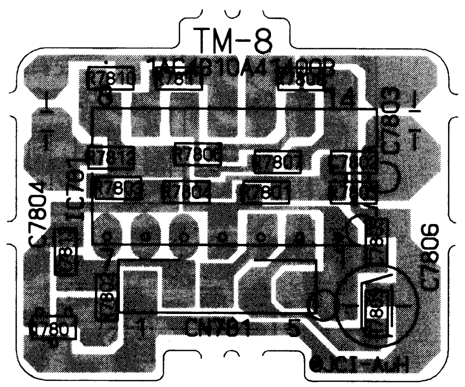
## TN-7 P.C.B.


TN-7
T6901
IC691
Q6921
CN691
C6904

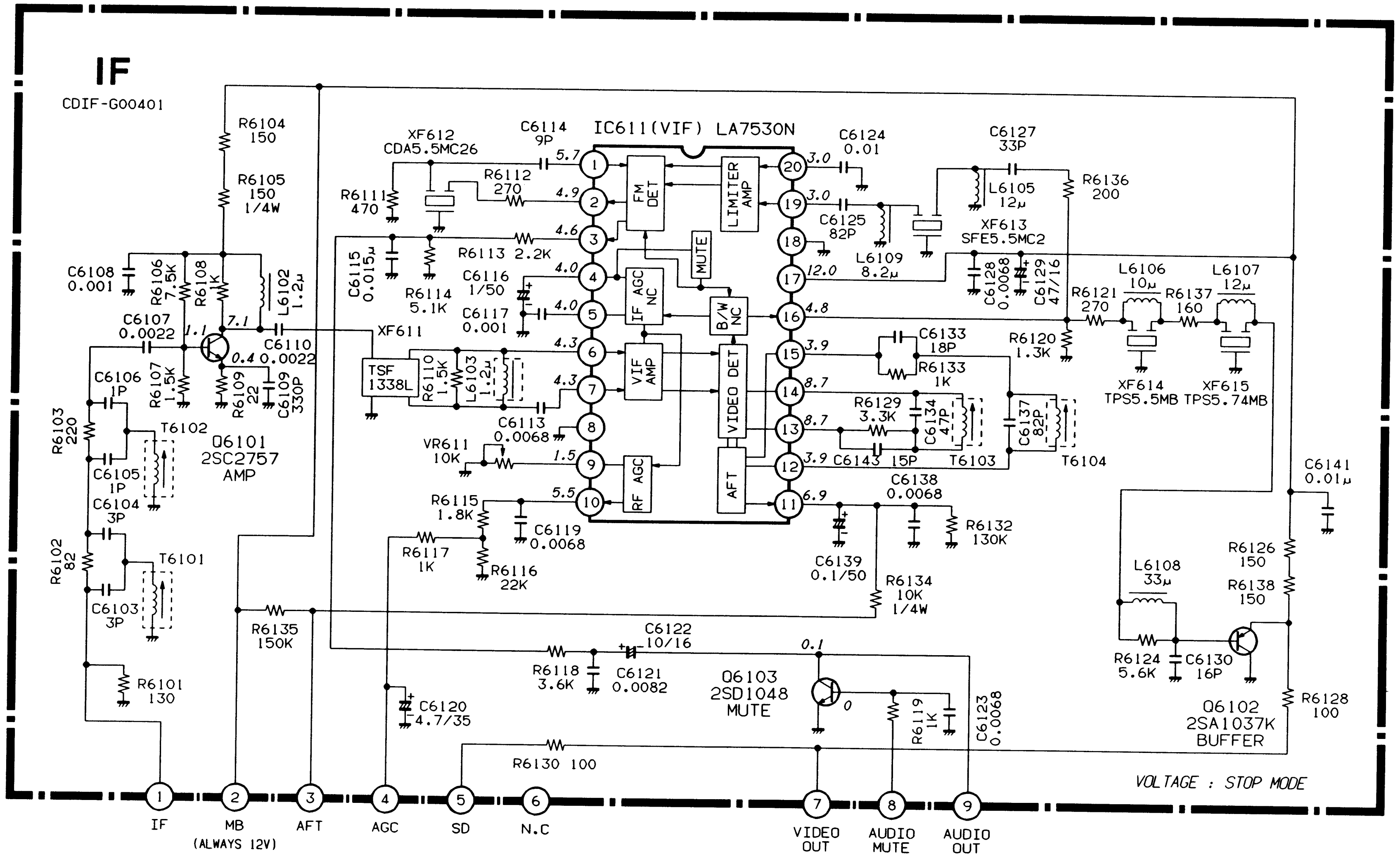
## TM-8 BOARD VPS CIRCUIT DIAGRAM (VHR-7200G, VHR-7100G ONLY)


TM-8
T8-12500/RP1-G
CN781
ALWAYS 5V
SD
VPS SDA
VPS SCL
GND
TO CP-1(TN-A)
C7805
0.1
C7806
22/16
Q7801
2SC2812
BUFFER
R7802
1K
R7804
180
R7803
1K
C7802
150P
R7805
2.2K
R7801
470
C7803
0.33
R7806
1M
R7807
820K
R7808
100K
R7809
10K
IC781 SDA5642
VPS CONTROL
VDD
VSS
CVBS
SCL
IREF
SDA
VCO
CSO
INUL
VCS
PD1
DAVN
T1
EHB
R7811
100
R7810
1.2M
R7812
5.6K
C7804
0.1

## TM-8 P.C.B.

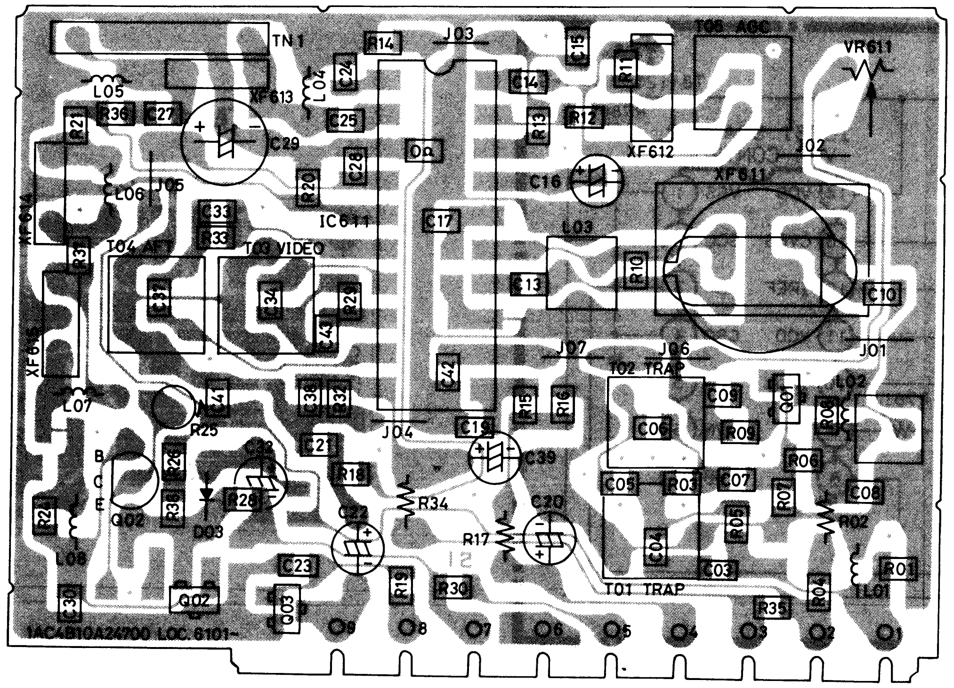

TM-8
C7803
C7804
C7806
CN781

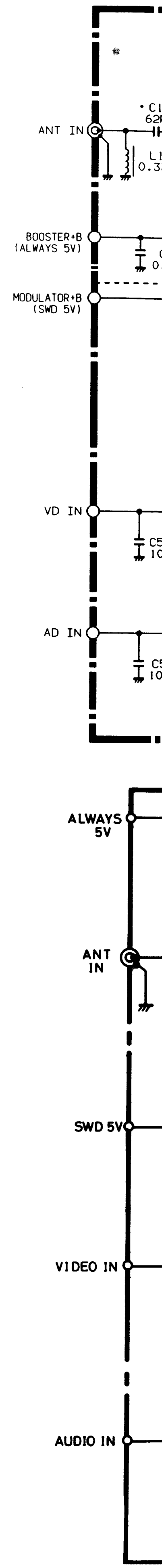
## IF CIRCUIT DIAGRAM (VHR-7200G, EX, VHR-7100G, EX)


IF
CDIF-G00401
IC611(VIF) LA7530N
FM DET
LIMITER AMP
MUTE
IF AGC NC
B/W NC
VIF AMP
VIDEO DET
RF AGC
AFT
R6104 150
R6105 150 1/4W
R6106 7.5K
R6108 1K
L6102 1.2μ
C6108 0.001
C6107 0.0022
C6110 0.0022
C6106 1P
R6107 1.5K
R6109 22
C6109 330P
R6103 220
T6102
Q6101 2SC2757 AMP
C6105 1P
C6104 3P
R6102 82
T6101
C6103 3P
R6101 130
XF612 CDA5.5MC26
R6111 470
R6112 270
C6114 9P
R6113 2.2K
C6115 0.015μ
R6114 5.1K
C6116 1/50
C6117 0.001
XF611
TSF 1338L
R6110 1.5K
L6103 1.2μ
C6113 0.0068
VR611 10K
R6115 1.8K
C6119 0.0068
R6117 1K
R6116 22K
R6135 150K
C6124 0.01
C6125 82P
L6109 8.2μ
C6127 33P
L6105 12μ
XF613 SFE5.5MC2
R6136 200
C6128 0.0068
C6129 47/16
R6121 270
L6106 10μ
R6137 160
L6107 12μ
XF614 TPS5.5MB
XF615 TPS5.74MB
C6133 18P
R6133 1K
R6120 1.3K
R6129 3.3K
C6134 47P
C6137 82P
C6143 15P
T6103
T6104
C6138 0.0068
C6139 0.1/50
R6132 130K
R6134 10K 1/4W
C6141 0.01μ
L6108 33μ
R6126 150
R6138 150
R6124 5.6K
C6130 16P
Q6102 2SA1037K BUFFER
R6128 100
C6122 10/16
R6118 3.6K
C6121 0.0082
Q6103 2SD1048 MUTE
R6119 1K
C6123 0.0068
C6120 4.7/35
R6130 100
5.7
4.9
4.6
4.0
4.0
4.3
4.3
1.5
5.5
3.0
3.0
12.0
4.8
3.9
8.7
8.7
3.9
6.9
1.1
7.1
0.4
0.1
0
VOLTAGE : STOP MODE
1 IF
2 MB (ALWAYS 12V)
3 AFT
4 AGC
5 SD
6 N.C
7 VIDEO OUT
8 AUDIO MUTE
9 AUDIO OUT

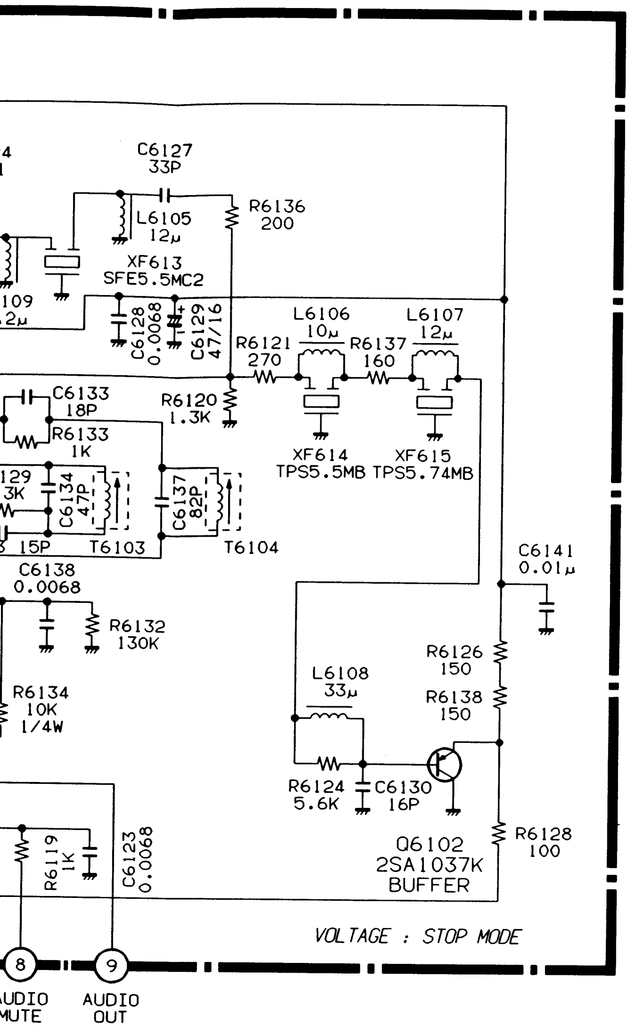
Note: Either one of these RF converters, type CDRF-G00010 or CDRF-G00370 is used, depending on availability.

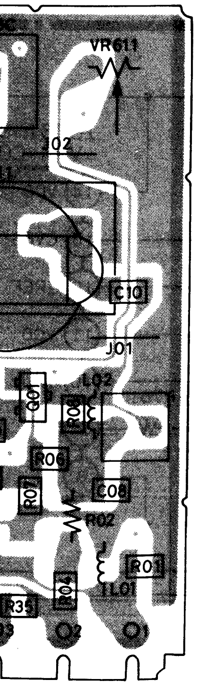
## IF P.C.B.


TN1
J03
T06 AGC
VR611
L05
XF613
C29
IC611
XF612
J02
XF611
C16
L03
L06
J05
T04 AFT
T03 VIDEO
J07
J06
J01
T02 TRAP
L07
R25
Q02
D03
C39
C20
R34
R17
J04
T01 TRAP
L01
L02
Q01
Q03
R02
1AC4B10A24700 LOC. 6101~

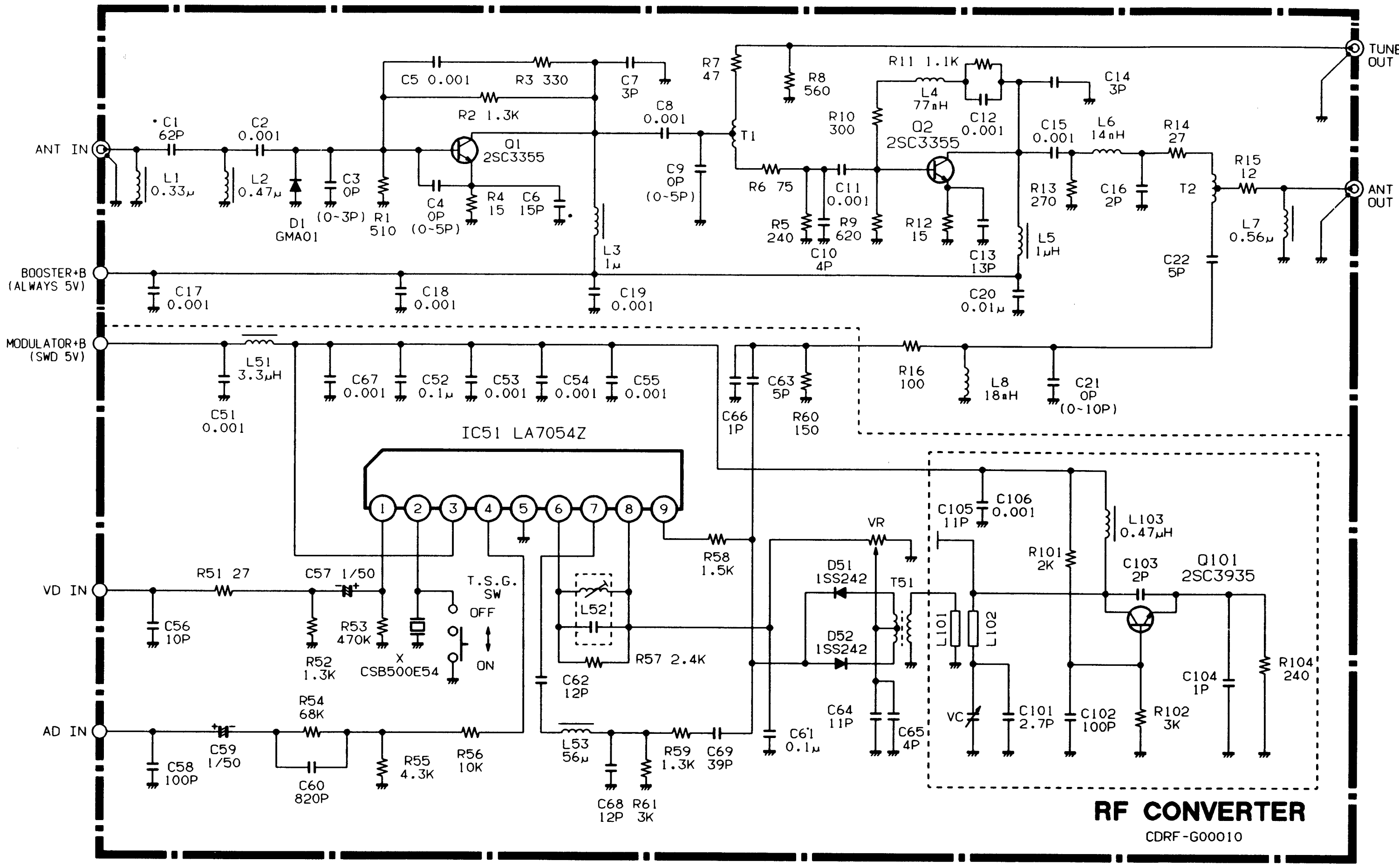

ANT IN
BOOSTER+B (ALWAYS 5V)
MODULATOR+B (SWD 5V)
VD IN
AD IN
ALWAYS 5V
ANT IN
SWD 5V
VIDEO IN
AUDIO IN

## R-7100G, EX)

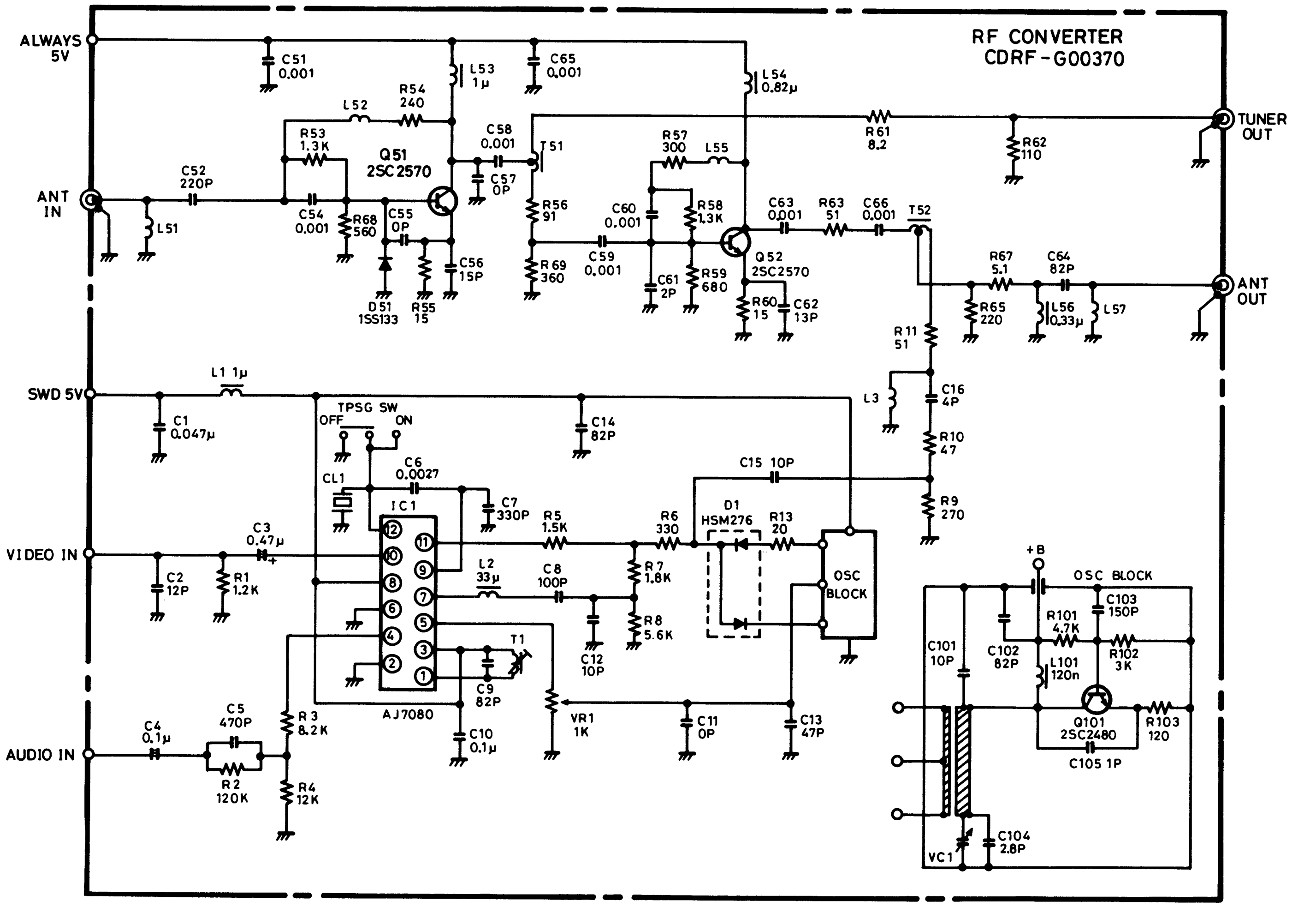

C6127 33P
L6105 12μ
R6136 200
XF613 SFE5.5MC2
C6128 0.0068
C6129 47/16
L6106 10μ
L6107 12μ
R6121 270
R6137 160
C6133 18P
R6120 1.3K
R6133 1K
C6134 47P
C6137 82P
XF614 TPS5.5MB
XF615 TPS5.74MB
T6103
T6104
C6138 0.0068
R6132 130K
C6141 0.01μ
R6134 10K 1/4W
L6108 33μ
R6126 150
R6138 150
R6124 5.6K
C6130 16P
Q6102 2SA1037K BUFFER
R6128 100
R6119 1K
C6123 0.0068
VOLTAGE : STOP MODE
8
9
AUDIO MUTE
AUDIO OUT


VR611
C10
J01
R06
R07
C08
R02
R03
L01
R04

## RF CONVERTER CIRCUIT


ANT IN
BOOSTER+B (ALWAYS 5V)
MODULATOR+B (SWD 5V)
VD IN
AD IN
TUNER OUT
ANT OUT
C1 62P
L1 0.33μ
C2 0.001
L2 0.47μ
D1 GMA01
C3 0P (0-3P)
R1 510
C5 0.001
R3 330
R2 1.3K
Q1 2SC3355
C4 0P (0-5P)
R4 15
C6 15P
C7 3P
C8 0.001
C9 0P (0-5P)
L3 1μ
R7 47
R8 560
T1
R11 1.1K
L4 77nH
C12 0.001
C14 3P
R10 300
Q2 2SC3355
R6 75
C11 0.001
R5 240
R9 620
C10 4P
R12 15
C13 13P
L5 1μH
C15 0.001
L6 14nH
R14 27
R13 270
C16 2P
T2
R15 12
L7 0.56μ
C22 5P
C17 0.001
C18 0.001
C19 0.001
C20 0.01μ
L51 3.3μH
C51 0.001
C67 0.001
C52 0.1μ
C53 0.001
C54 0.001
C55 0.001
C63 5P
C66 1P
R60 150
R16 100
L8 18nH
C21 0P (0~10P)
IC51 LA7054Z
R51 27
C56 10P
C57 1/50
R53 470K
R52 1.3K
X CSB500E54
T.S.G. SW
OFF
ON
L52
R57 2.4K
C62 12P
R58 1.5K
D51 1SS242
D52 1SS242
T51
VR
C61 0.1μ
C64 11P
C65 4P
R54 68K
C58 100P
C59 1/50
C60 820P
R55 4.3K
R56 10K
L53 56μ
R59 1.3K
C69 39P
C68 12P
R61 3K
C105 11P
C106 0.001
R101 2K
L103 0.47μH
C103 2P
Q101 2SC3935
L101
L102
VC
C101 2.7P
C102 100P
R102 3K
C104 1P
R104 240
RF CONVERTER
CDRF-G00010

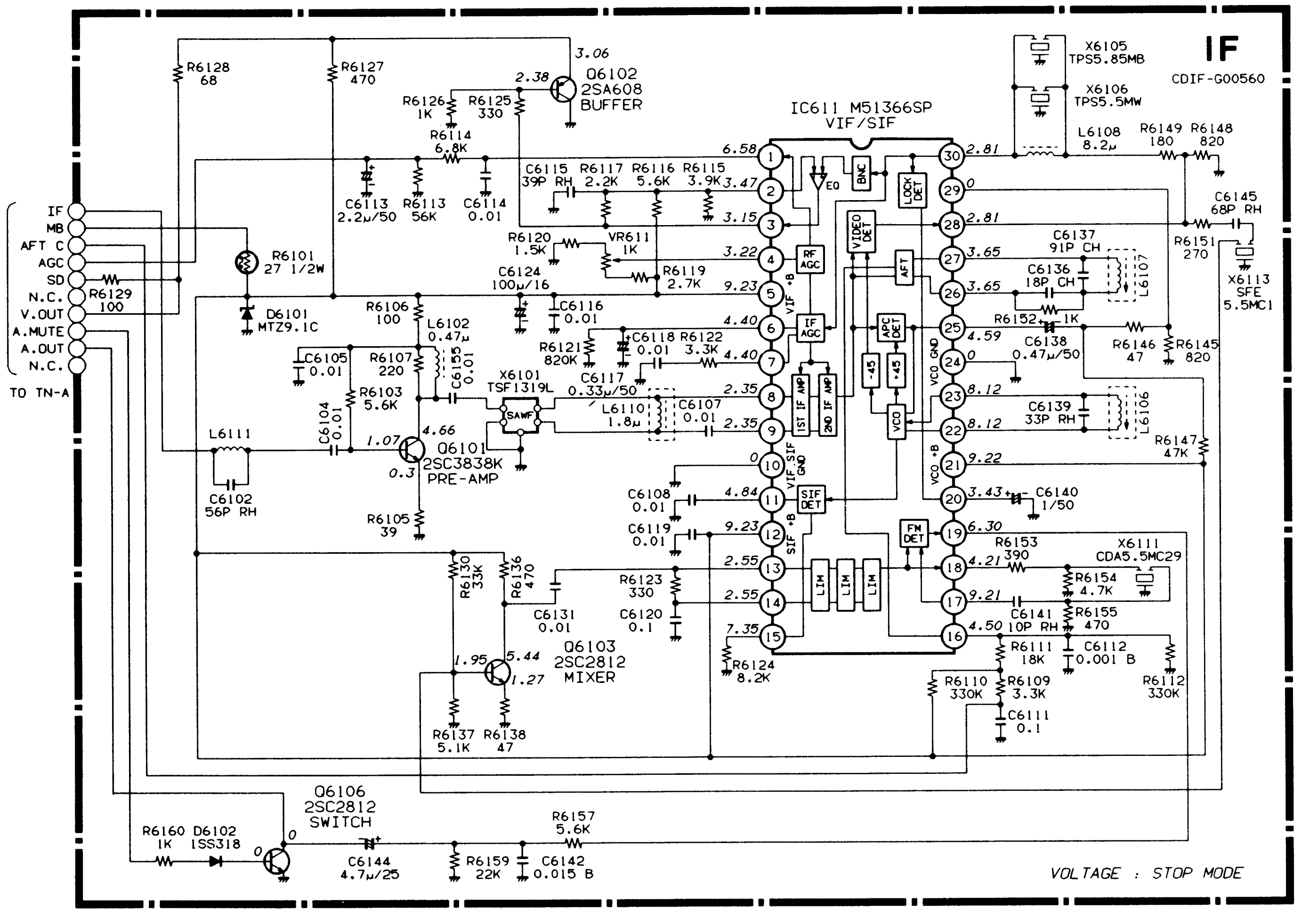
## RF CONVERTER CIRCUIT


RF CONVERTER CDRF-G00370
ALWAYS 5V
ANT IN
SWD 5V
VIDEO IN
AUDIO IN
TUNER OUT
ANT OUT
C51 0.001
L53 1μ
C65 0.001
L54 0.82μ
L52
R54 240
R53 1.3K
Q51 2SC2570
C58 0.001
C57 0P
T51
C52 220P
L51
C54 0.001
R68 560
C55 0P
C56 15P
D51 1SS133
R55 15
R56 91
R69 360
C59 0.001
C60 0.001
R57 300
L55
R58 1.3K
C61 2P
R59 680
Q52 2SC2570
R60 15
C62 13P
C63 0.001
R63 51
C66 0.001
T52
R61 8.2
R62 110
R67 5.1
C64 82P
R65 220
L56 0.33μ
L57
R11 51
L3
C16 4P
R10 47
R9 270
L1 1μ
C1 0.047μ
TPSG SW
OFF
ON
C14 82P
C6 0.0027
CL1
C7 330P
IC1
C15 10P
D1 HSM276
R13 20
R6 330
R5 1.5K
C3 0.47μ
C2 12P
R1 1.2K
L2 33μ
C8 100P
R7 1.6K
R8 5.6K
OSC BLOCK
C12 10P
T1
C9 82P
C10 0.1μ
VR1 1K
C11 0P
C13 47P
AJ7080
C4 0.1μ
C5 470P
R2 120K
R3 8.2K
R4 12K
+B
OSC BLOCK
C101 10P
C102 82P
R101 4.7K
C103 150P
L101 120n
R102 3K
Q101 2SC2480
R103 120
C105 1P
C104 2.8P
VC1

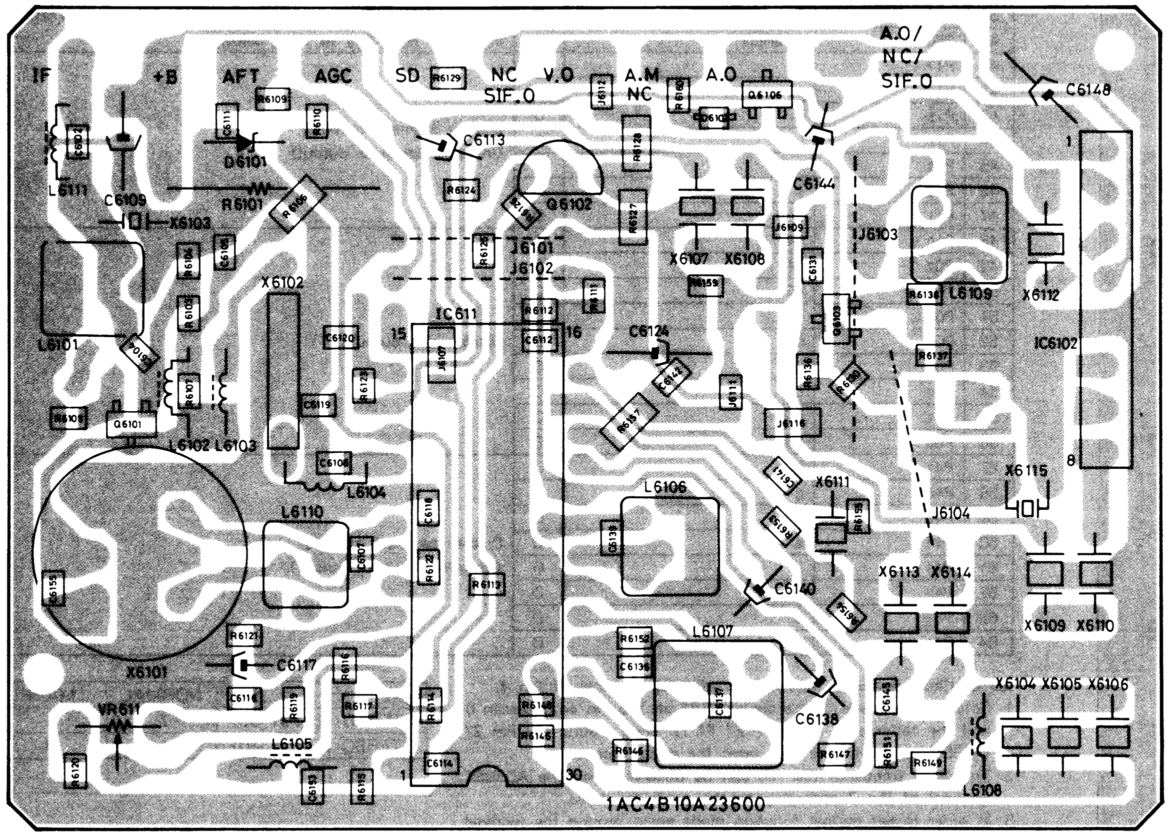
Note: Either one of these RF converters, type CDRF-G00010 or CDRF-G00370 is used, depending on availability.

8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23

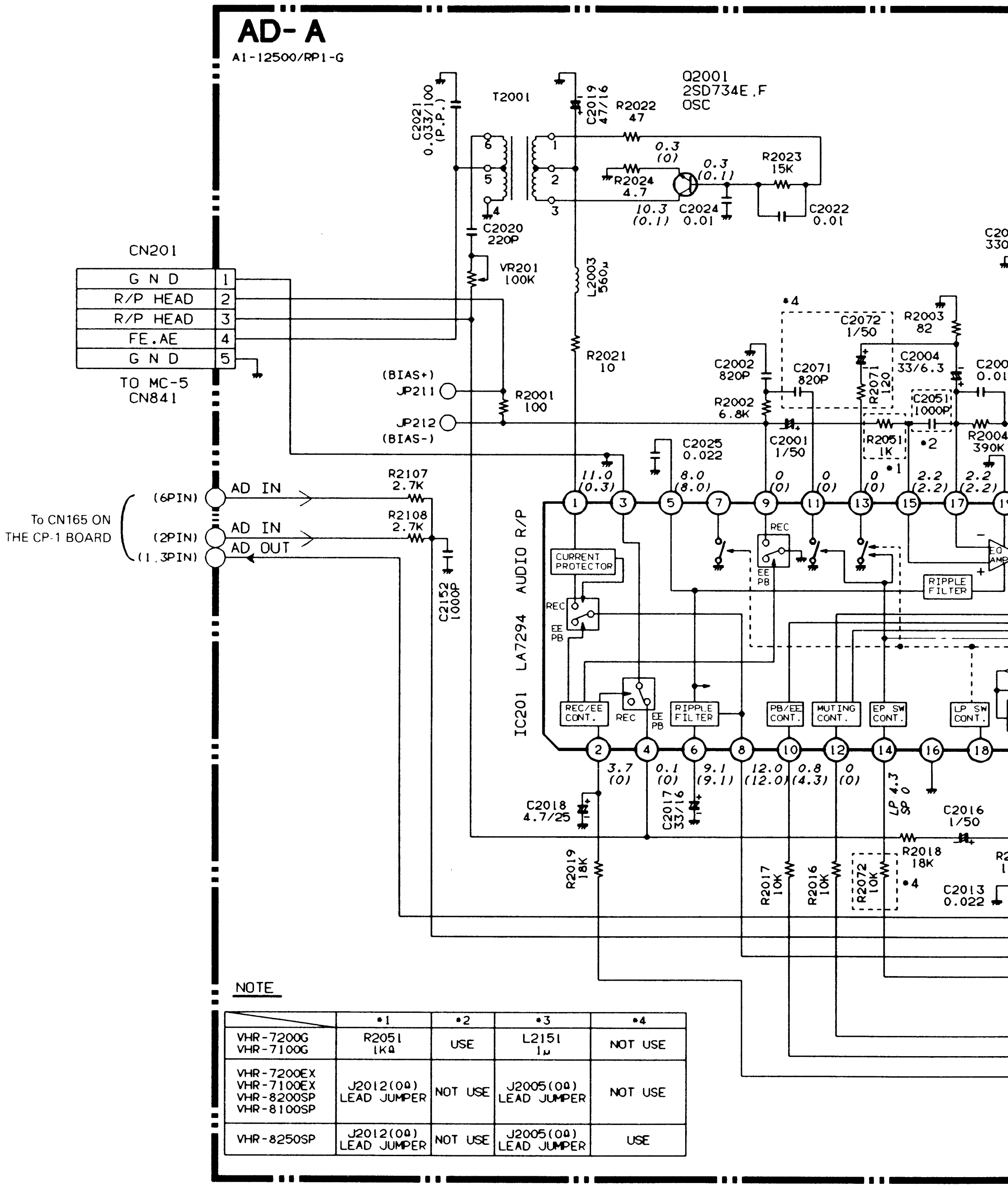
## IF CIRCUIT DIAGRAM (VHR-8200SP, VHR-8100SP, VHR-8250SP)


IF
CDIF-G00560
IC611 M51366SP
VIF/SIF
Q6102
2SA608
BUFFER
Q6101
2SC3838K
PRE-AMP
Q6103
2SC2812
MIXER
Q6106
2SC2812
SWITCH
X6101
TSF1319L
X6105
TPS5.85MB
X6106
TPS5.5MW
X6111
CDA5.5MC29
X6113
SFE
5.5MC1
D6101
MTZ9.1C
R6160 D6102
1K 1SS318
IF
MB
AFT C
AGC
SD
N.C.
V.OUT
A.MUTE
A.OUT
N.C.
TO TN-A
VOLTAGE : STOP MODE

## IF P.C.B.


IF
+B
AFT
AGC
SD
NC
SIF.O
V.O
A.M
NC
A.O
A.O/
NC/
SIF.O
IC611
IC6102
X6101
X6102
L6101
L6111
L6106
L6107
L6108
L6109
L6110
VR611
1AC4B10A23600

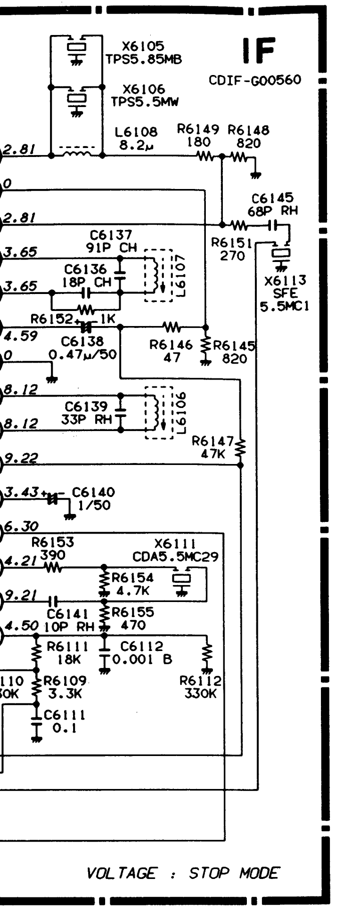
## CP-1 BOARD (AD-A) AUDIO CI

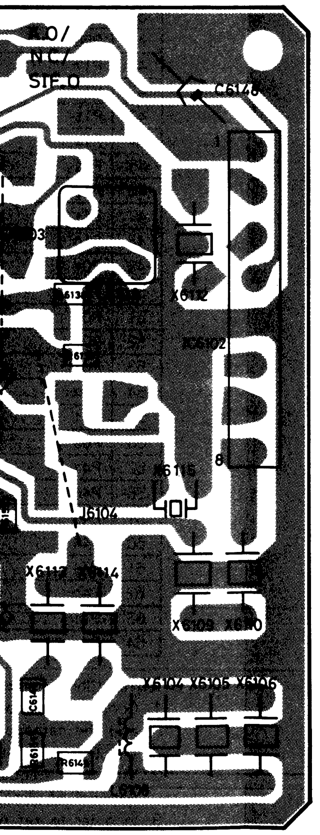

AD-A
A1-12500/RP1-G
CN201
GND
R/P HEAD
R/P HEAD
FE.AE
GND
TO MC-5
CN841
To CN165 ON
THE CP-1 BOARD
(6PIN)
(2PIN)
(1,3PIN)
AD IN
AD IN
AD OUT
(BIAS+)
JP211
JP212
(BIAS-)
T2001
Q2001
2SD734E,F
OSC
IC201 LA7294 AUDIO R/P
CURRENT PROTECTOR
REC/EE CONT.
RIPPLE FILTER
PB/EE CONT.
MUTING CONT.
EP SW CONT.
LP SW CONT.

NOTE

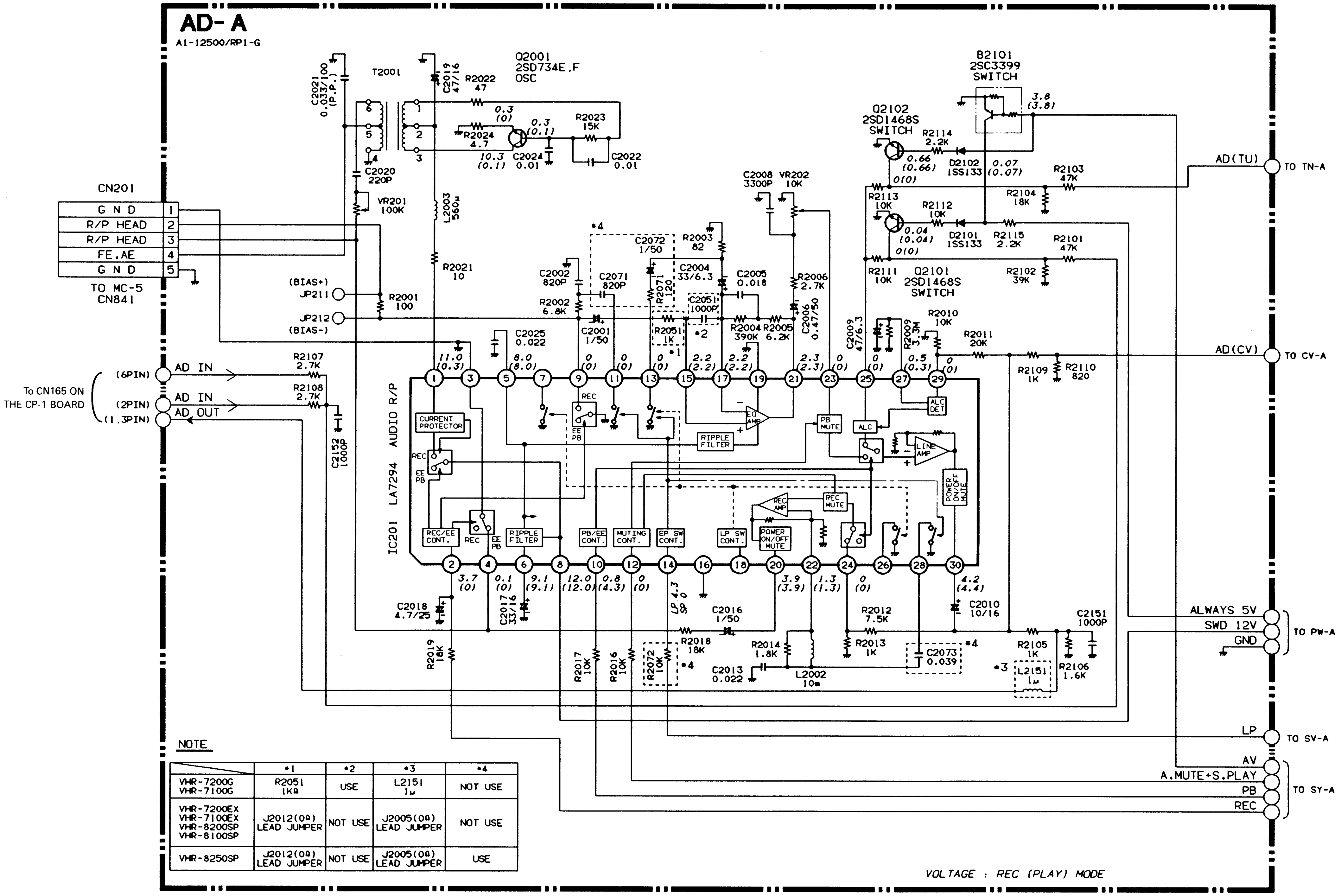
| | *1 | *2 | *3 | *4 |
|---|---|---|---|---|
| VHR-7200G<br>VHR-7100G | R2051<br>1KΩ | USE | L2151<br>1μ | NOT USE |
| VHR-7200EX<br>VHR-7100EX<br>VHR-8200SP<br>VHR-8100SP | J2012(0Ω)<br>LEAD JUMPER | NOT USE | J2005(0Ω)<br>LEAD JUMPER | NOT USE |
| VHR-8250SP | J2012(0Ω)<br>LEAD JUMPER | NOT USE | J2005(0Ω)<br>LEAD JUMPER | USE |

HR-8250SP)


IF
CDIF-G00560
X6105 TPS5.85MB
X6106 TPS5.5MW
L6108 8.2μ
R6149 180
R6148 820
C6145 68P RH
R6151 270
X6113 SFE 5.5MC1
C6137 91P CH
C6136 18P CH
L6107
R6152 1K
C6138 0.47μ/50
R6146 47
R6145 820
C6139 33P RH
L6106
R6147 47K
C6140 1/50
R6153 390
X6111 CDA5.5MC29
R6154 4.7K
C6141
R6155 470
R6111 18K
C6112 0.001 B
R6109 3.3K
C6111 0.1
R6112 330K
VOLTAGE : STOP MODE



## CP-1 BOARD (AD-A) AUDIO CIRCUIT DIAGRAM


AD-A
A1-12500/RP1-G
CN201
1 GND
2 R/P HEAD
3 R/P HEAD
4 FE.AE
5 GND
TO MC-5 CN841
T2001
C2021 0.033/100 (P.P.)
C2019 47/16
R2022 47
Q2001 2SD734E.F OSC
R2024 4.7
C2024 0.01
R2023 15K
C2022 0.01
C2020 220P
VR201 100K
L2003 560μ
R2021 10
(BIAS+) JP211
(BIAS-) JP212
R2001 100
C2002 820P
C2071 820P
C2072 1/50
R2071 120
R2003 82
C2004 33/6.3
C2005 0.018
C2051 1000P
R2002 6.8K
C2001 1/50
R2051 1K
R2004 390K
R2005 6.2K
C2008 3300P
VR202 10K
R2006 2.7K
C2006 0.47/50
C2025 0.022
C2009 47/6.3
R2009 3.3M
B2101 2SC3399 SWITCH
Q2102 2SD1468S SWITCH
R2114 2.2K
D2102 1SS133
R2113 10K
R2112 10K
D2101 1SS133
R2115 2.2K
R2103 47K
R2104 18K
R2101 47K
R2111 10K
Q2101 2SD1468S SWITCH
R2102 39K
R2010 10K
R2011 20K
R2109 1K
R2110 820
AD(TU)
TO TN-A
AD(CV)
TO CV-A
To CN165 ON THE CP-1 BOARD
(6PIN) AD IN
(2PIN) AD IN
(1,3PIN) AD OUT
R2107 2.7K
R2108 2.7K
C2152 1000P
IC201 LA7294 AUDIO R/P
CURRENT PROTECTOR
REC/EE CONT.
RIPPLE FILTER
PB/EE CONT.
MUTING CONT.
EP SW CONT.
EQ AMP
PB MUTE
ALC
ALC DET
LINE AMP
POWER ON/OFF MUTE
REC AMP
REC MUTE
LP SW CONT.
C2018 4.7/25
R2019 18K
C2017 33/16
R2017 10K
R2016 10K
R2072 10K
R2018 18K
C2016 1/50
R2014 1.8K
C2013 0.022
L2002 10m
R2012 7.5K
R2013 1K
C2073 0.039
C2010 10/16
R2105 1K
L2151 1μ
R2106 1.6K
C2151 1000P
ALWAYS 5V
SWD 12V
GND
TO PW-A
LP
TO SV-A
AV
A.MUTE+S.PLAY
PB
REC
TO SY-A
VOLTAGE : REC (PLAY) MODE

NOTE

|  | *1 | *2 | *3 | *4 |
|---|---|---|---|---|
| VHR-7200G<br>VHR-7100G | R2051<br>1KΩ | USE | L2151<br>1μ | NOT USE |
| VHR-7200EX<br>VHR-7100EX<br>VHR-8200SP<br>VHR-8100SP | J2012(0Ω)<br>LEAD JUMPER | NOT USE | J2005(0Ω)<br>LEAD JUMPER | NOT USE |
| VHR-8250SP | J2012(0Ω)<br>LEAD JUMPER | NOT USE | J2005(0Ω)<br>LEAD JUMPER | USE |

## IC301 (LC66308A) SYSTEM CONTROL MPU PIN FUNCTIONS TABLE

| NO. | Name | I/O | I/O Signal Function |
|---|---|---|---|
| 1 | FF + REW | O | Output during FF/REW. |
| 2 | POWER UP | O | Output when the power is ON. POWER ON : H |
| 3 | INPUT SELECT | O | Output when selecting an EE external input. |
| 4 | AV CTL or<br>ANT/$\overline{\text{VTR}}$ | O<br>O | The same as the signal (PB H) for 8-pin Euro connector for selection of a RF converter output. Option by Pin 41. |
| 5 | REC H | O | REC indication signal. REC : H |
| 6 | PB H | O | PB image output indication signal. PB image : H |
| 7 | STILL + F.ADV | O | Broaden the H DOC pulse width during still frame advance. |
| 8 | A MUTE | O | Audio output inhibit indication signal. MUTE : H |
| 9 | $\overline{\text{SSB DATA}}$ | I | For communications with the timer microprocessor.<br>8 bit × 12 block serial data. |
| 10 |  | O |  |
| 11 | $\overline{\text{SSB CLK}}$ | O | Clock pulse for SSB. |
| 12 | CTL PULSE | I | Approx. 25 Hz during REC/PB. Pulse for linear time counter.<br>For discrimination of audio output mute while playing back the non-recorded portion. |
| 13 | $\overline{\text{CAP. FG PULSE}}$ | I | Capstan FG signal. While checking the pulse width of this signal, the brake is applied to the capstan motor. |
| 14 | DOC PULSE | I | Noise feeding during STILL (PAUSE). |
| 15 | 4K PWM | O | Outputs a 4 kHz PWM signal for approx. twelve seconds at the start of FF/REW to gradually start the tape running speed. |
| 16 | HOLD | I | + 5V |
| 17 | ML F | O | For indicating the loading in FWD direction. |
| 18 | ML R | O | For indicating the loading in RVS direction. |
| 19 | TEST |  | GND |
| 20 | Vss |  | GND |
| 21 | OSC1 |  | Clock oscillator (clock frequency of 4 MHz). |
| 22 | OSC2 |  |  |
| 23 | $\overline{\text{RESET}}$ | I | Initial reset |
| 24 | $\overline{\text{ML L}}$ | O | Loading motor low-speed indication signal |
| 25 | $\overline{\text{ML M}}$ | O | Loading motor medium-speed indication signal |
| 26 | $\overline{\text{SW DATA 1}}$ | I | Mechanical position switch |
| 27 | $\overline{\text{SW DATA 2}}$ |  |  |
| 28 | $\overline{\text{SW DATA 3}}$ |  |  |
| 29 | $\overline{\text{RF SE PULS}}$ | I | 25 Hz drum rotation detection during REC/PB. Takes timing during still noise feeding. |
| 30 | Mc BR | O | Capstan motor accelerating/decelerating signal<br>Capstan motor brake<br>Noise feeding during STILL |
| 31 | $\overline{\text{SV S DATA}}$ | O | Serial data to servo microprocessor |
| 32 | $\overline{\text{SV S CLK}}$ | O | Clock to the servo microprocessor |
| 33 | SAFTY SW | I | Erase prevention switch signal. With tab : L Without tab : H |
| 34 | FL START SW | I | Front loading (cassette loading) SW |
| 35 | V_REF | I | Reference voltage for internal comparator (for TAPE TOP S, TAPE END S ports) |
| 36 | REEL PULS | I | Reel table rotation detection |
| 37 | DEW SENSOR | I | Dew detection DEW : H |
| 38 | TAPE TOP S. | I | Tape winding start detection |
| 39 | TAPE END S. | I | Tape winding end detection |
| 40 | Vdd |  | 5V |
| 41 | OPTION | I | For Pin 4 output selection<br>5V : AV CTL<br>2.5V : ANT/$\overline{\text{VTR}}$ |
| 42 | TAPE SPEED | I | Tape speed discriminating data during PB (SP : LOW LP : HIGH) |

P66308-0

## IC351 (LC7416) DIGITAL SERVO IC PIN FUNCTIONS TABLE

| Pin No. | I/O Terminal Name | I/O | Input/Output Function |
|---|---|---|---|
| 1 | FSC IN | I | Input for the IC internal system clock pulse. A level of at least 0.3 Vp-p is required.<br>The color subcarrier signal is input by capacitive coupling. |
| 2 | $V_{SS}$ |  | Ground |
| 3 | C-SYNC | I | Composite sync signal input. |
| 4 | VD | O | Dummy $V_D$ signal output. |
| 5 | NC | — | NC |
| 6 | NC | — |  |
| 7 | RF-SW-PULSE | O | Video head switching pulse output. |
| 8 | AF-SW-PULSE | O | Audio head (FM) switching pulse output. |
| 9 | DL1 | I | Dummy $V_D$ insertion position control CR. |
| 10 | CTL-IN | I | Control signal input. |
| 11 | REMAK | O | Outputs the control signal re-recording control signal. Three-value output (H, M, L). |
| 12 | REC-CTL | O | Recording control signal output. Three-value output (H, OPEN, L). |
| 13 | NC | — | NC |
| 14 | D-PG. MM | I | CR for drum PG signal delay. |
| 15 | D-PG | I | Drum PG signal input. |
| 16 | NC | — | NC |
| 17 | D-FG | I | Drum FG signal input. |
| 18 | DSE | O | Outputs the speed error for drum system speed control. An output making the drum motor stop is delivered when DRUM-ON is "0".<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 19 | FHE | O | Outputs the horizontal sync signal of the composite sync signal after F-V conversion (using the drum phase control system).<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 20 | DPE |  | Error output for drum system phase control.<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 21 | C-START/STP | O | Outputs the capstan motor start and brake pulses in the slow mode. |
| 22 | CSE | O | Capstan system speed error output. An output making the capstan motor stop is delivered when CAP-ON is "0".<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 23 | CPE | O | Capstan system phase reciprocal error output.<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 24 | $\overline{\text{F}}$/R | O | Capstan motor forward/reverse control output. "1" sets the reverse mode, and "0" the forward mode. |
| 25 | C-FG1 | I | Capstan FG signal input. |
| 26 | NC | — | NC |
| 27 | NC | — | NC |
| 28 | EP/LP/SP | O | Recording mode output. Three-value output ("H" is for EP mode, "M" for LP mode and "L" for SP mode). |
| 29 | SP | O | Recording mode output. "H" is for SP mode. |
| 30 | CAP-BRK | I | Control input for capstan brake timing. (MC-BR) |
| 31 | TRK-CR | I | CR for tracking adjustment. |
| 32 | NC | — | NC |
| 33 | D-WD1 | I | CR for drum compensation timing adjustment in the slow mode. |
| 34 | NC | — | NC |
| 35 | REF-TRK | O | Outputs the tracking delay input signal. |
| 36 | MODE (× 2+STILL) | O | Mode decoding signal output. At the × 2 SPEED mode and starting time of SLOW/STILL mode, output "H" level. |
| 37 | NC | — | NC |
| 38 | 1/0-CK | O | Outputs the CTL signal for realtime counter. |
| 39 | SV-S • CLK | I | Serial transmission clock pulse input. |
| 40 | SV-S • DATA | I | Serial data input terminal. |
| 41 | NTSC/$\overline{\text{PAL}}$ | I | NTSC/PAL switching input. "H" is for NTSC, "L" for PAL. |
| 42 | $V_{DD}$ |  | + 5V supply terminal |

LC7416

## IC711

| Pin No. |  |
|---|---|
| 1 | Vcc |
| 2 | $P6_5$ |
| 3 | $P6_4$ |
| 4 | $P6_3$/ |
| 5 | $P6_2$/ |
| 6 | $P6_1$/ |
| 7 | $P6_0$/ |
| 8 | $P2_7$ |
| 9 | $P2_6$ |
| 10 | $P2_5$ |
| 11 | $P2_4$ |
| 12 | $P2_3$ |
| 13 | $P2_2$ |
| 14 | $P2_1$ |
| 15 | $P2_0$ |
| 16 | $P3_7$/ |
| 17 | $P3_6$/ |
| 18 | $P3_5$/ |
| 19 | $P3_4$/ |
| 20 | $P3_3$/ |
| 21 | $P3_2$/ |
| 22 | $P3_1$ |
| 23 | $P3_0$ |
| 24 | $P5_3$/ |
| 25 | $P5_2$/ |
| 26 | CNV |
| 27 | $\overline{\text{RESE}}$ |
| 28 | Xin |
| 29 | Xout |
| 30 | Xcin |
| 31 | Xcou |
| 32 | Vss |
| 33 | ϕ |
| 34 | $P5_7$ |
| 35 | $P5_6$ |
| 36 | $P5_5$ |
| 37 | $P5_4$ |
| 38 | Vp |
| 39 | $P5_1$ |
| 40 | $P5_0$ |
| 41 | $P1_7$ |
| 42 | $P1_6$ |
| 43 | $P1_5$ |
| 44 | $P1_4$ |
| 45 | $P1_3$ |
| 46 | $P1_2$ |
| 47 | $P1_1$ |
| 48 | $P1_0$ |
| 49 | $P0_7$ |
| 50 | $P0_6$ |
| 51 | $P0_5$ |
| 52 | $P0_4$ |
| 53 | $P0_3$ |
| 54 | $P0_2$ |
| 55 | $P0_1$ |
| 56 | $P0_0$ |
| 57 | $P4_7$ |
| 58 | $P4_6$ |
| 59 | $P4_5$ |
| 60 | $P4_4$ |
| 61 | $P4_3$ |
| 62 | $P4_2$ |
| 63 | $P4_1$ |
| 64 | $P4_0$ |

**NOTE** : Clock
1. Connect t
and the c
($\overline{\text{RESET}}$) t
2. The clock
terminal c
3. In order t
of Pin 2
removing

F converter output.

portion.

applied to the capstan

EW to gradually start the

feeding.

s)

P66308-0

## IC351 (LC7416) DIGITAL SERVO IC PIN FUNCTIONS TABLE

| Pin No. | I/O Terminal Name | I/O | Input/Output Function |
|---|---|---|---|
| 1 | FSC IN | I | Input for the IC internal system clock pulse. A level of at least 0.3 Vp-p is required. The color subcarrier signal is input by capacitive coupling. |
| 2 | V$_{SS}$ |  | Ground |
| 3 | C-SYNC | I | Composite sync signal input. |
| 4 | VD | O | Dummy V$_D$ signal output. |
| 5 | NC | — | NC |
| 6 | NC | — |  |
| 7 | RF-SW-PULSE | O | Video head switching pulse output. |
| 8 | AF-SW-PULSE | O | Audio head (FM) switching pulse output. |
| 9 | DL1 | I | Dummy V$_D$ insertion position control CR. |
| 10 | CTL-IN | I | Control signal input. |
| 11 | REMAK | O | Outputs the control signal re-recording control signal. Three-value output (H, M, L). |
| 12 | REC-CTL | O | Recording control signal output. Three-value output (H, OPEN, L). |
| 13 | NC | — | NC |
| 14 | D-PG. MM | I | CR for drum PG signal delay. |
| 15 | D-PG | I | Drum PG signal input. |
| 16 | NC | — | NC |
| 17 | D-FG | I | Drum FG signal input. |
| 18 | DSE | O | Outputs the speed error for drum system speed control. An output making the drum motor stop is delivered when DRUM-ON is "0".<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 19 | FHE | O | Outputs the horizontal sync signal of the composite sync signal after F-V conversion (using the drum phase control system).<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 20 | DPE |  | Error output for drum system phase control.<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 21 | C-START/STP | O | Outputs the capstan motor start and brake pulses in the slow mode. |
| 22 | CSE | O | Capstan system speed error output. An output making the capstan motor stop is delivered when CAP-ON is "0".<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 23 | CPE | O | Capstan system phase reciprocal error output.<br>The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation). |
| 24 | $\overline{\text{F}}$/R | O | Capstan motor forward/reverse control output. "1" sets the reverse mode, and "0" the forward mode. |
| 25 | C-FG1 | I | Capstan FG signal input. |
| 26 | NC | — | NC |
| 27 | NC | — | NC |
| 28 | EP/LP/SP | O | Recording mode output. Three-value output ("H" is for EP mode, "M" for LP mode and "L" for SP mode). |
| 29 | SP | O | Recording mode output. "H" is for SP mode. |
| 30 | CAP-BRK | I | Control input for capstan brake timing. (MC-BR) |
| 31 | TRK-CR | I | CR for tracking adjustment. |
| 32 | NC | — | NC |
| 33 | D-WD1 | I | CR for drum compensation timing adjustment in the slow mode. |
| 34 | NC | — | NC |
| 35 | REF-TRK | O | Outputs the tracking delay input signal. |
| 36 | MODE (×2+STILL) | O | Mode decoding signal output. At the ×2 SPEED mode and starting time of SLOW/STILL mode, output "H" level. |
| 37 | NC | — | NC |
| 38 | 1/0-CK | O | Outputs the CTL signal for realtime counter. |
| 39 | SV-S • CLK | I | Serial transmission clock pulse input. |
| 40 | SV-S • DATA | I | Serial data input terminal. |
| 41 | NTSC/$\overline{\text{PAL}}$ | I | NTSC/PAL switching input. "H" is for NTSC, "L" for PAL. |
| 42 | V$_{DD}$ |  | +5V supply terminal |

LC7416

## IC711 (M50958) TIMER MPU PIN FUNCTIONS TABLE

| Pin No. | Port | Input/Output Signal | I/O | Input/Output Function |
|---|---|---|---|---|
| 1 | Vcc |  |  | +5V |
| 2 | P6$_5$ | $\overline{\text{I}}$/BG | O | PAL transmission system switching ("L" = PAL I ; "H" = PAL BG) |
| 3 | P6$_4$ |  | – |  |
| 4 | P6$_3$/PWM3 | BAND1 | O | Band data output (BAND1, BAND2)<br>(L, L) = VHF-LOW (L, H) = VHF-HIGH (H, L) = UHF (H, H) = SKIP |
| 5 | P6$_2$/PWM2 | BAND2 | O |  |
| 6 | P6$_1$/PWM1 | PWM | O | Tuning voltage output. (PWM signal) |
| 7 | P6$_0$/T | ADJUST | O | Pulse output (32.768kHz/1024 = 32Hz) for clock frequency adjustment. |
| 8 | P2$_7$ | $\overline{\text{CLK}}$ | O | Clock pulse output to the E$^2$ PROM. |
| 9 | P2$_6$ | DI | I/O | Data exchange with the E$^2$ PROM. |
| 10 | P2$_5$ | $\overline{\text{E}^2\text{ PROM CS1}}$ | O | E$^2$ PROM 1 is accessed when "L". |
| 11 | P2$_4$ | $\overline{\text{PAL}}$/SECAM | O | Transmission system switching ("L" = PAL ; "H" = SECAM). |
| 12 | P2$_3$ | VIDEO MUTE | O | "H" output during VIDEO MUTE |
| 13 | P2$_2$ | TUNER ON | O | "H" output when tuner power is ON. |
| 14 | P2$_1$ | $\overline{\text{AUDIO MUTE}}$ | O | "L" output during AUDIO MUTE. |
| 15 | P2$_0$ | AFT MUTE | O | "H" output during AFT MUTE. |
| 16 | P3$_7$/$\overline{\text{Srdy}}$ | $\overline{\text{CH+}}$ | O | CH+ system switching ("L" = CH+ON) |
| 17 | P3$_6$/CLK | $\overline{\text{S.CLK}}$ | I | SSB clock pulse input. |
| 18 | P3$_5$/Sout | $\overline{\text{S.OUT}}$ | O | SSB data output. |
| 19 | P3$_4$/Sin | S.IN | I | SSB data input. |
| 20 | P3$_3$/ANin | AFT.C | I | AFT.S curve input. |
| 21 | P3$_2$/CNTR | H.SYNC | I | Sync. detection signal input for existing channel discrimination.<br>("L" = Existing Sync.) |
| 22 | P3$_1$ | SCL | O | Clock pulse output to the VPS decoder IC. |
| 23 | P3$_0$ | SDA | I/O | Data exchange with the VPS decoder IC. |
| 24 | P5$_3$/INT$_1$ | $\overline{\text{POWER DOWN}}$ | I | Power failure mode set at "L" input. |
| 25 | P5$_2$/INT$_2$ | IR SIG. IN | I | Remote control signal input. |
| 26 | CNVss |  |  | Ground. |
| 27 | $\overline{\text{RESET}}$ |  |  | Reset terminal. |
| 28 | Xin |  |  | 6MHz clock terminal. |
| 29 | Xout |  |  |  |
| 30 | Xcin |  |  | 32.768kHz (clock OSC used in the power failure mode) |
| 31 | Xcout |  |  |  |
| 32 | Vss |  |  | Ground |
| 33 | $\phi$ |  |  |  |
| 34 | P5$_7$ | KEY IN4 | I | Key inputs |
| 35 | P5$_6$ | KEY IN3 | I |  |
| 36 | P5$_5$ | KEY IN2 | I |  |
| 37 | P5$_4$ | KEY IN1 | I |  |
| 38 | Vp | Vp |  | -30V |
| 39 | P5$_1$ | STEREO R | O | 2-bit signal output for AUDIO OUTPUT SELECT and audio output display indication according to table below. |
| 40 | P5$_0$ | STEREO L | O |  |
| 41 | P1$_7$ | o | O | Display segment outputs.<br>(Included key-scan output) |
| 42 | P1$_6$ | n | O |  |
| 43 | P1$_5$ | m | O |  |
| 44 | P1$_4$ | l | O |  |
| 45 | P1$_3$ | k | O |  |
| 46 | P1$_2$ | j | O |  |
| 47 | P1$_1$ | i | O |  |
| 48 | P1$_0$ | G9 | O | Display grid outputs. |
| 49 | P0$_7$ | G8 | O |  |
| 50 | P0$_6$ | G7 | O |  |
| 51 | P0$_5$ | G6 | O |  |
| 52 | P0$_4$ | G5 | O |  |
| 53 | P0$_3$ | G4 | O |  |
| 54 | P0$_2$ | G3 | O |  |
| 55 | P0$_1$ | G2 | O |  |
| 56 | P0$_0$ | G1 | O |  |
| 57 | P4$_7$ | h | O | Display segment outputs.<br>(Included key-scan output) |
| 58 | P4$_6$ | g | O |  |
| 59 | P4$_5$ | f | O |  |
| 60 | P4$_4$ | e | O |  |
| 61 | P4$_3$ | d | O |  |
| 62 | P4$_2$ | c | O |  |
| 63 | P4$_1$ | b | O |  |
| 64 | P4$_0$ | a | O |  |

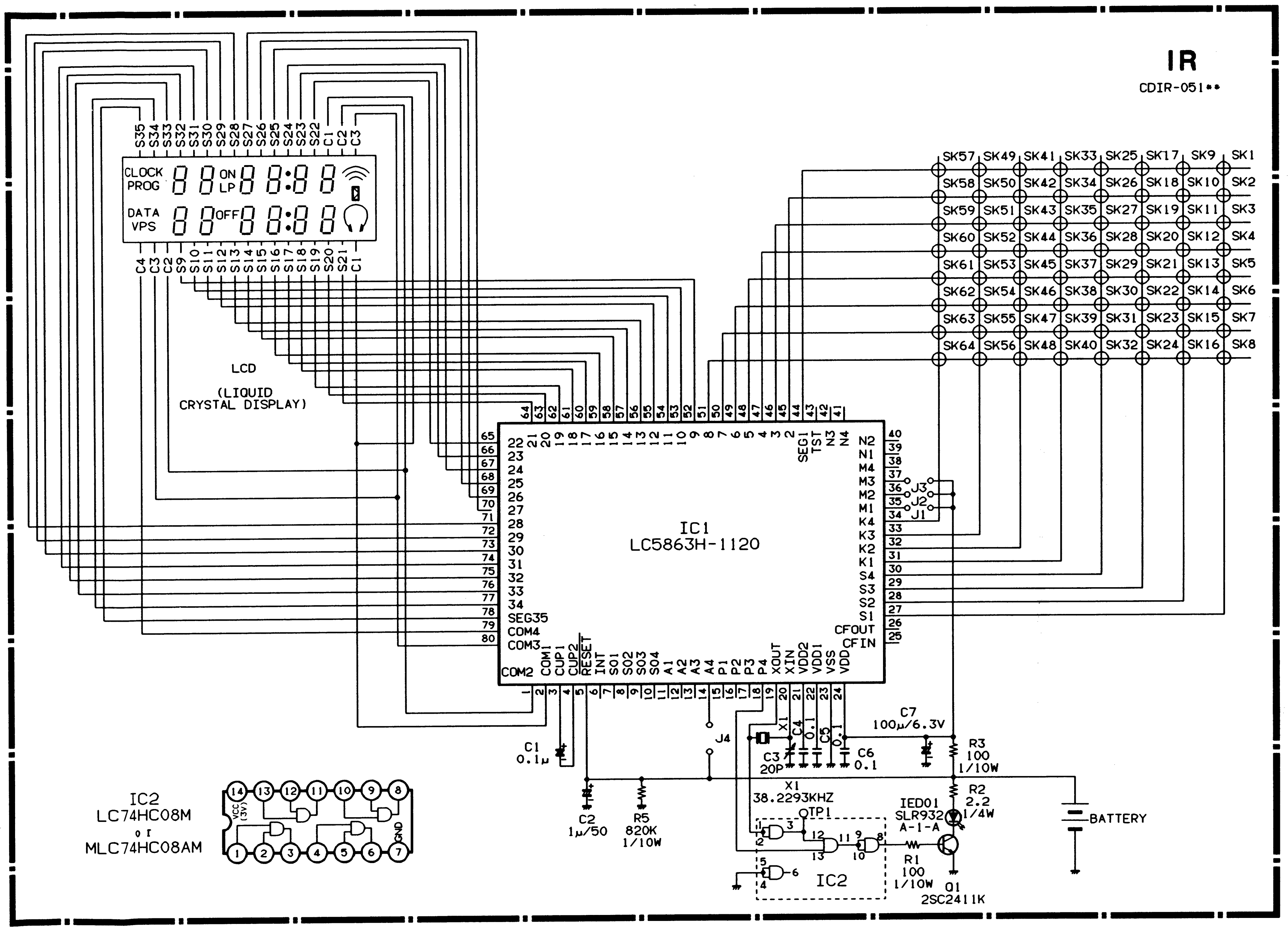
**NOTE** : Clock frequency check with ADJUST terminal of Pin 7.

1. Connect the anode of the diode (IS188 etc.) to Pin 44 (key-scan l) and the cathode to Pin 37 (KEY IN 1). Then ground the Pin 27 ($\overline{\text{RESET}}$) terminal once and reset the microcomputer.
2. The clock frequency (32 Hz) can be observed with the ADJUST terminal of Pin 7 according to the servicing above.
3. In order to set normal function mode again, ground the terminal of Pin 27 ($\overline{\text{RESET}}$) once and reset the microcomputer after removing the diode connected to Pins 44 and 37.

| PORT \ MODE | NORMAL | MAIN | SUB | STEREO |
|---|---|---|---|---|
| STEREO R (Pin 39) | L | L | H | H |
| STEREO L (Pin 40) | L | H | L | H |

P50958V0

## IR REMOTE CONTROL CIRCUIT DIAGRAM
## (VHR-7200G, EX, VHR-8200SP, VHR-8250SP)


IR
CDIR-051**
LCD
(LIQUID CRYSTAL DISPLAY)
CLOCK
PROG
DATA
VPS
ON
LP
OFF
IC1
LC5863H-1120
SEG35
COM4
COM3
COM2
COM1
CUP1
CUP2
RESET
INT
SEG1
TST
N2
N1
M4
M3
M2
M1
K4
K3
K2
K1
S4
S3
S2
S1
CFOUT
CFIN
XOUT
XIN
VDD2
VDD1
VSS
VDD
J1
J2
J3
J4
C1 0.1μ
C2 1μ/50
R5 820K 1/10W
C3 20P
C4 0.1
C5 0.1
C6 0.1
C7 100μ/6.3V
R3 100 1/10W
R2 2.2 1/4W
R1 100 1/10W
X1 38.2293KHZ
TP1
IED01 SLR932 A-1-A
Q1 2SC2411K
BATTERY
IC2
IC2 LC74HC08M or MLC74HC08AM
VCC (3V)
GND
SK1
SK2
SK3
SK4
SK5
SK6
SK7
SK8

AVAILABLE KEY FUNCTION OF REMOTE CONTROL UNIT

| KEY NO. | FUNCTION | | KEY NO. | FUNCTION | | KEY NO. | FUNCTION | |
|---|---|---|---|---|---|---|---|---|
| 1 | PAUSE | USE | 23 | MARK | | 45 | CHECK | USE |
| 2 | STOP | USE | 24 | CNT M | USE | 46 | CHSCAN | |
| 3 | MODE - | | 25 | CH + | USE | 47 | OK | |
| 4 | REC | USE | 26 | 0/AV | USE | 48 | M.STILL | |
| 5 | | USE | 27 | CH - | USE | 49 | 3 | USE |
| 6 | MODE + | | 28 | A.SEL | | 50 | 2 | USE |
| 7 | SEARCH | | 29 | CANCEL | USE | 51 | 1 | USE |
| 8 | SLOW | | 30 | ← | | 52 | VPS | USE *1 |
| 9 | FF | USE | 31 | ↑ | | 53 | PROG | USE |
| 10 | PLAY | USE | 32 | → | | 54 | M.CALL | |
| 11 | BLANK | USE | 33 | 9 | USE | 55 | OSD | |
| 12 | REW | USE | 34 | 8 | USE | 56 | ERASE | |
| 13 | A.TR | | 35 | 7 | USE | 57 | TRANS | USE |
| 14 | C.DISP | | 36 | SC | | 58 | ZOOM | |
| 15 | SPECIAL | USE | 37 | CLOCK | USE | 59 | MONITOR | USE |
| 16 | RESET | USE | 38 | SIZE | | 60 | VCR/TV | |
| 17 | EJECT | | 39 | ART | | 61 | POWER | USE |
| 18 | R.PLAY | | 40 | INST | | 62 | PRESET | |
| 19 | X2S | | 41 | 6 | USE | 63 | NR | |
| 20 | A.DUB | | 42 | 5 | USE | 64 | MUTE | |
| 21 | INSERT | | 43 | 4 | USE | | | |
| 22 | ↓ | | 44 | SP/LP | *2 | | | |

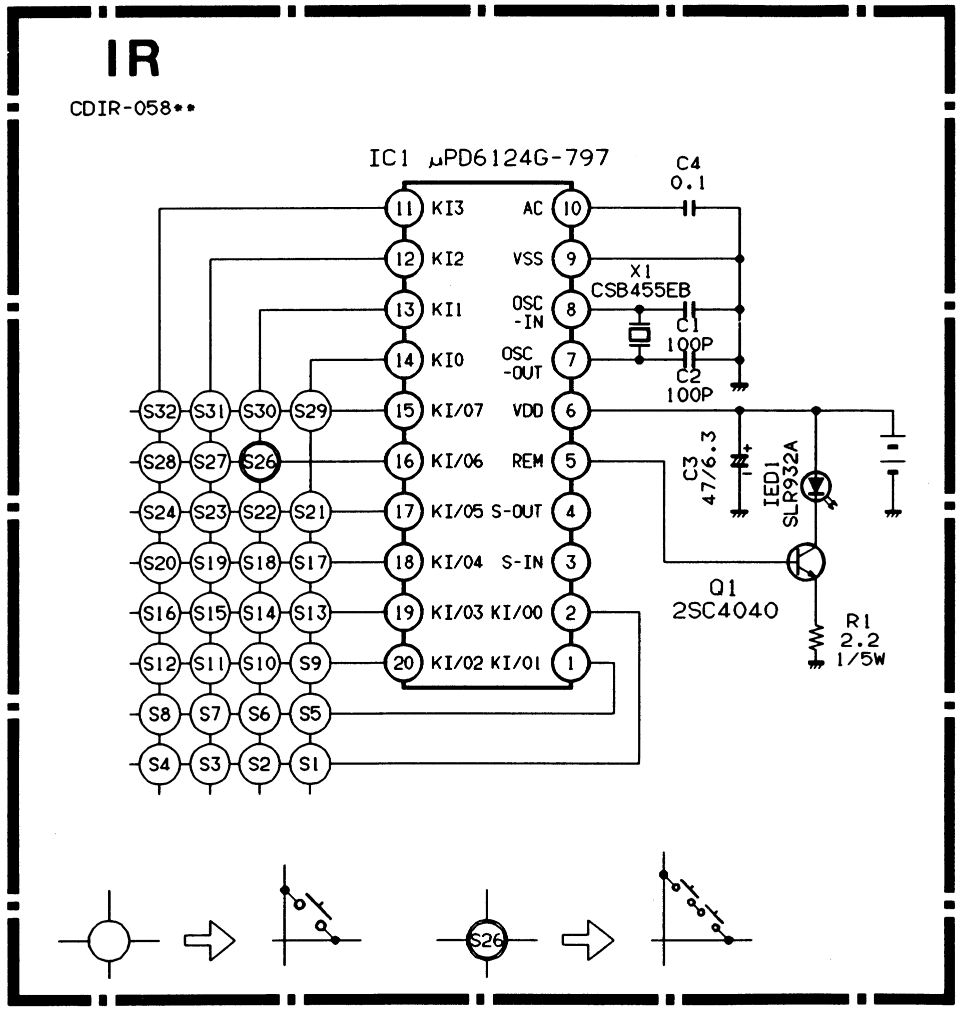
IR-05101

NOTE

| | *1 | *2 |
|---|---|---|
| VHR-7200G | USE | NOT USE |
| VHR-7200EX<br>VHR-8200SP | NOT USE | NOT USE |
| VHR-8250SP | NOT USE | USE |

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15

## IR REMOTE CONTROL CIRCUIT DIAGRAM
## (VHR-7100G, EX, VHR-8100SP)


IR
CDIR-058**
IC1 μPD6124G-797
KI3
KI2
KI1
KI0
KI/07
KI/06
KI/05
KI/04
KI/03
KI/02
AC
VSS
OSC -IN
OSC -OUT
VDD
REM
S-OUT
S-IN
KI/00
KI/01
C4 0.1
X1 CSB455EB
C1 100P
C2 100P
C3 47/6.3
IED1 SLR932A
Q1 2SC4040
R1 2.2 1/5W
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S19 S20 S21 S22 S23 S24 S26 S27 S28 S29 S30 S31 S32

AVAILABLE KEY FUNCTION
OF REMOTE CONTROL UNIT

| KEY NO | FUNCTION | |
|---|---|---|
| S1 | POWER | USE |
| S2 | VTR/TV | |
| S3 | RESET | USE |
| S4 | MEMORY | USE |
| S5 | PROG | USE |
| S6 | 1 | USE |
| S7 | 2 | USE |
| S8 | 3 | USE |
| S9 | CLOCK | USE |
| S10 | 4 | USE |
| S11 | 5 | USE |
| S12 | 6 | USE |
| *1 S13 | VPS | USE |
| S14 | 7 | USE |
| S15 | 8 | USE |
| S16 | 9 | USE |
| S17 | CANCEL | USE |
| S18 | ⇤ | USE |
| S19 | 0/AV | USE |
| S20 | ⇥ | USE |
| S21 | BLANK | USE |
| S22 | REW | USE |
| S23 | PLAY | USE |
| S24 | FF | USE |
| S26 | REC | USE |
| S27 | STOP | USE |
| S28 | PAUSE/STILL | USE |
| S29 | SP/LP | |
| S30 | REMAIN | |
| S31 | TRACK | |
| S32 | MONITOR | USE |

NOTE

| | *1 |
|---|---|
| VHR-7100G | USE |
| VHR-7100EX<br>VHR-8100SP | NOT USE |

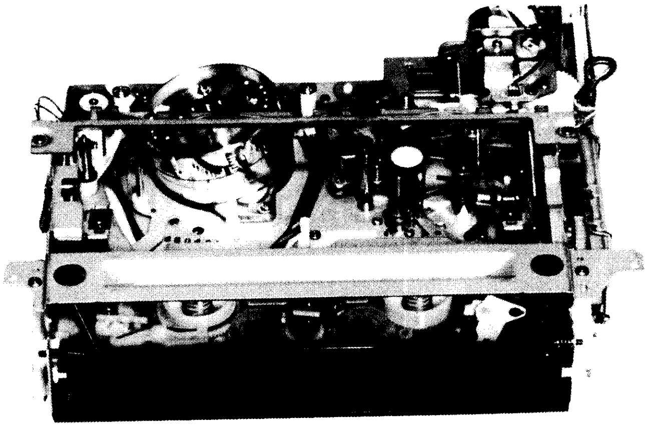
IR-05800

SANYO

# Mechanism Service Technical Information

## Color Video Cassette Recorder

# P88 MECHANISM



VHS HQ
PAL SECAM

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REFERENCE No. WM-22534

# 1. OUTLINE OF MECHANISM

This mechanism is named P-88 Mechanism. Its features include :

(1) The chassis is fabricated by drawing a 1.6mm thick electric zinc plated steel sheet, and mechanical parts are ingeniously laid on this chassis. The mechanism is as thick as 70.3 mm, which indicates that it is 86 % thicker than conventional mechanisms hitherto available.

(2) After insertion of a cassette, the tape is normally wound to the head drum based on the full loading system. This design results in the shortening of the mode shift time, that is, the time from the depression of the PLAY pushbutton switch to the video image display on screen has been significantly quickened.

(3) The full loading system employed has the F/R search capability (when the same button (F.FWD or REW) is pressed in the F.FWD or REW modes, the search mode playback image appears on the screen).

(4) Also, a thin type head drum without lead is provided to increase the operating convenience of the equipment to a considerable extent.

(5) The drive source for cassette loading and the motor for the tape loading mode selection are used in combination with the head motor and the capstan motor for realization of a 3-motor system.

## 1-1. FULL LOADING MECHANISM

I. Quick playback
Mode shift time such as the STOP→PLAY and FF/REW→PLAY has been shortened for quicker playback.

II. High-speed VISS and VASS
The time from the detection of VISS/VASS search signal based on the VHS standardized search system till image display on the screen has considerably been shortened to make high-speed VISS and VASS possible.

(1) Description of full loading mechanism
As shown in Fig. 1-1 ⓐ, ⓑ, a tape has hitherto been wound onto the head drum only in the PLAY and F/R SEARCH mode, but in this radically new mechanism, in every mode can be made with the tape kept wound onto the head drum.

(2) Features of full loading mechanism
With the provision of the full loading mechanism, the operating convenience, which was hitherto a drawback of the VHS system, has been improved. A host of other salient features are also designed into this mechanism as apparent from the following description.

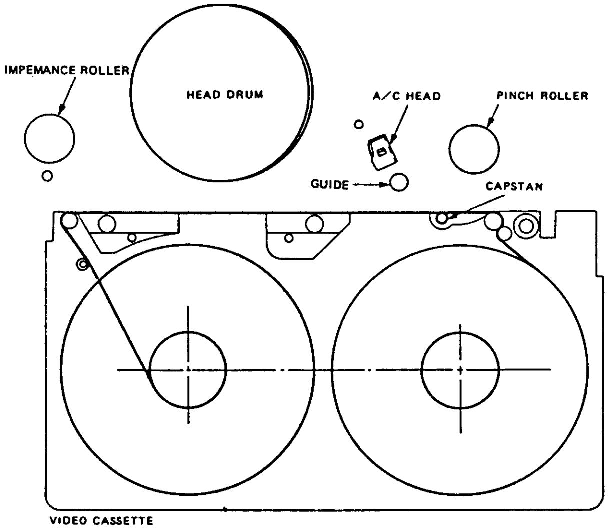


Fig. 1-1 ⓐ CONVENTIONAL VHS TAPE LOADING SYSTEM (AT FF/REW MODE)

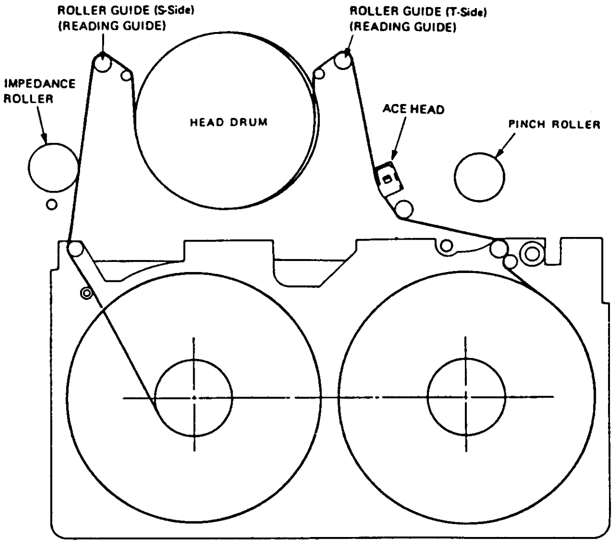


Fig. 1-1 ⓑ NEW FULL LOADING SYSTEM (AT FF/REW MODE)

III. F/R search
FF↔F-SEARCH and REW↔R-SEARCH can be made direct by reducing the mode transition

IV. Elimination of half loading mechanism
A special mechanism (the half loading mechanism in Fig. 1-2.) necessary for mounting the VISS/VASS functions and a realtime counter has hitherto been added to conventional models available, but the provision of the full loading mechanism simplifies the design of the mechanism, resulting in significantly enhanced reliability and increased convenience of operation.

(3) Protection mechanism for full loading system

I. Video Tape Protection Mechanism

(a) FF/REW→STOP
Tape tension applied to the head drum when stopping is lowered by optimizing the balance between the left and right, and brake forces acting on the left and right reel table. Thereby it prevents from causing a scratch on the tape due to V-head when stopping.

(b) STOP→FF/REW
The starting-up speed of the capstan motor is ingeniously designed to preclude the possibility of unusual tape tension at the time of REW/FWD start-up.

(c) Tape end brake damping
The design of the mechanism is so made that the time from issuance of an electrical STOP command till actual brake application is reduced to a minimum. This enable the braking to be completed before the reader tape end.

(d) FF/REW running
To ensure highly stable tape running in any condition and any environment, design consideration is given to the foundation brake torque (soft brake) to the reel table and the tape winding angle with respect to each tape guide. Particularly in regard to the supply side fixing guide and F.T.E (Full Track Erase) head, the design is so made that they do not come into contact with the tape at the time of FF/REW operation to alleviate load application.

II. Final End Position Tape Loading Protection Mechanism
Tape pull-out (loading) from within the cassette is done to ensure proper take-up of the tape onto the head drum. At that time, the tape is extended from the supply reel side.
So, if the tape is wound to the final end, no loading can be made. For this reason, a mode is designed to allow the tape to be rewound a little at the final end of the tape without any loading done.

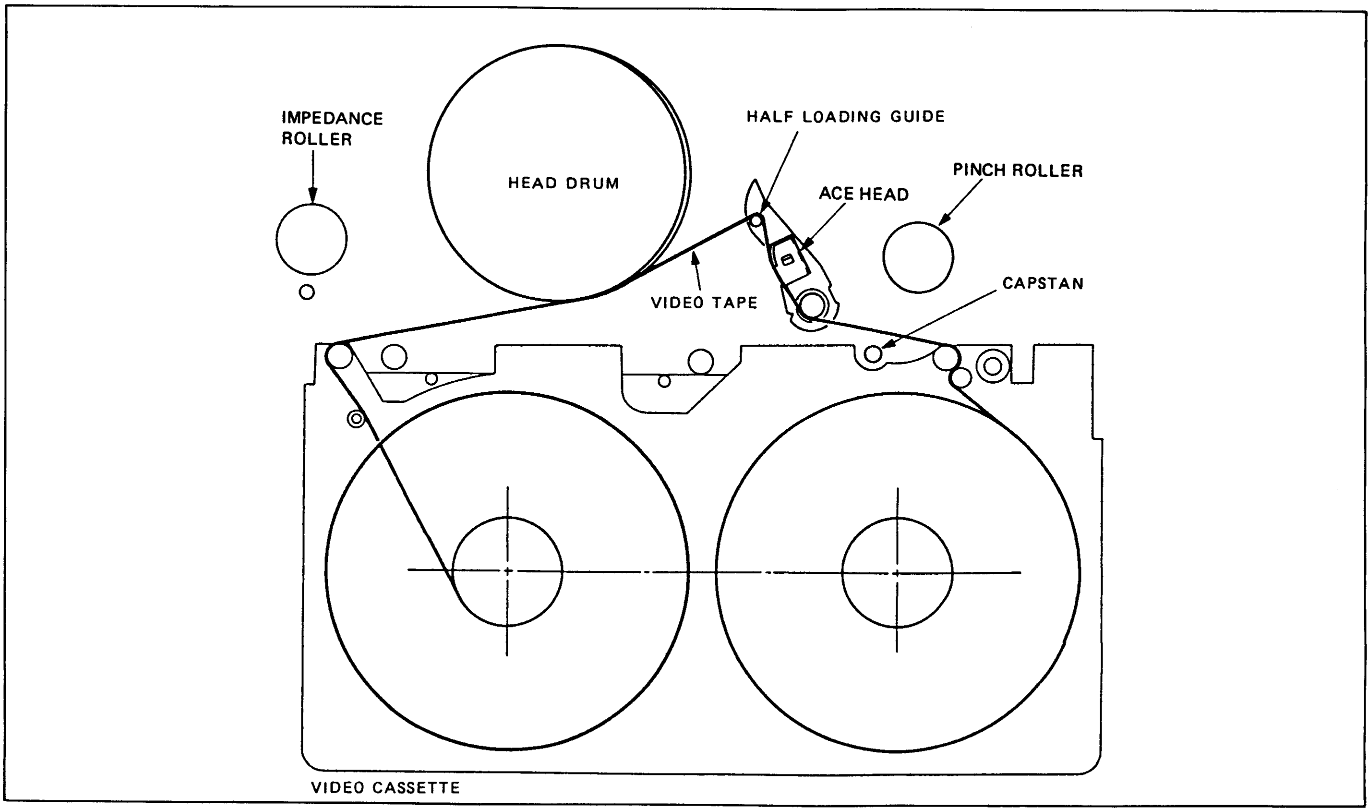
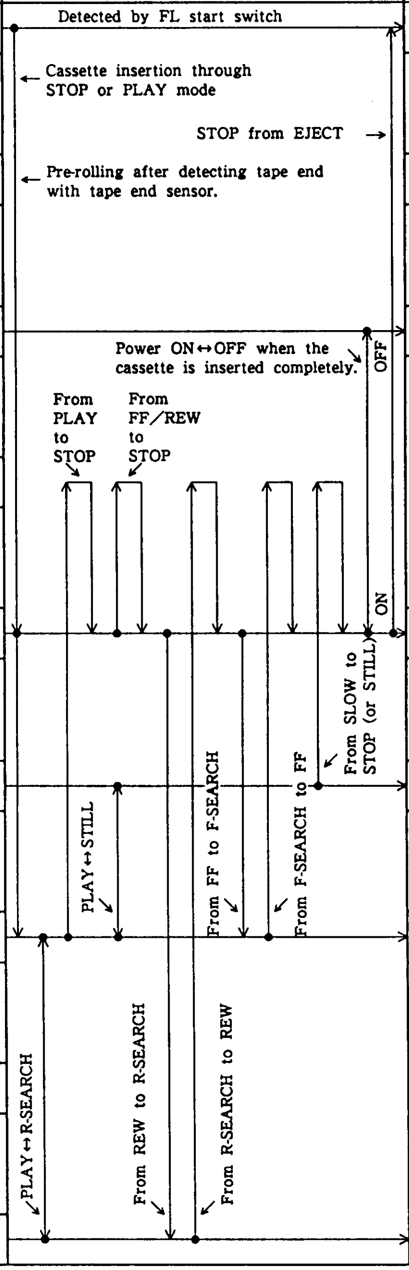


Fig. 1-2 HALF LOADING SYSTEM (AT FF/REW MODE)

# 2. DESCRIPTION OF MECHANISM OPERATION

## 2-1. BASIC OPERATION MODE OF MECHANISM

The P-88 mechanism has its original modes such as given in Table 2-1, in addition to the VTR is operation modes (STOP, FF, REW, PLAY, REC, R-SEARCH, F-SEARCH, STILL, SLOW, and ETS). These modes specific to the mechanism play important roles in tape protection operation at the time of a shift to various modes of the VTR above. A shift to the mode specific to the mechanism is carried out by controlling the rotation of the loading motor with the control signal of the system control circuit. The detection of important mechanism operation mode positions is done by using the FL START SWITCH for detecting the cassette ejection/insertion, the FL END SWITCH for detecting the cassette insert completion, and the MECHANISM MODE SWITCH for detecting each mode of the mechanism (3 bit MODE DATA is output by operating the rotary switch).

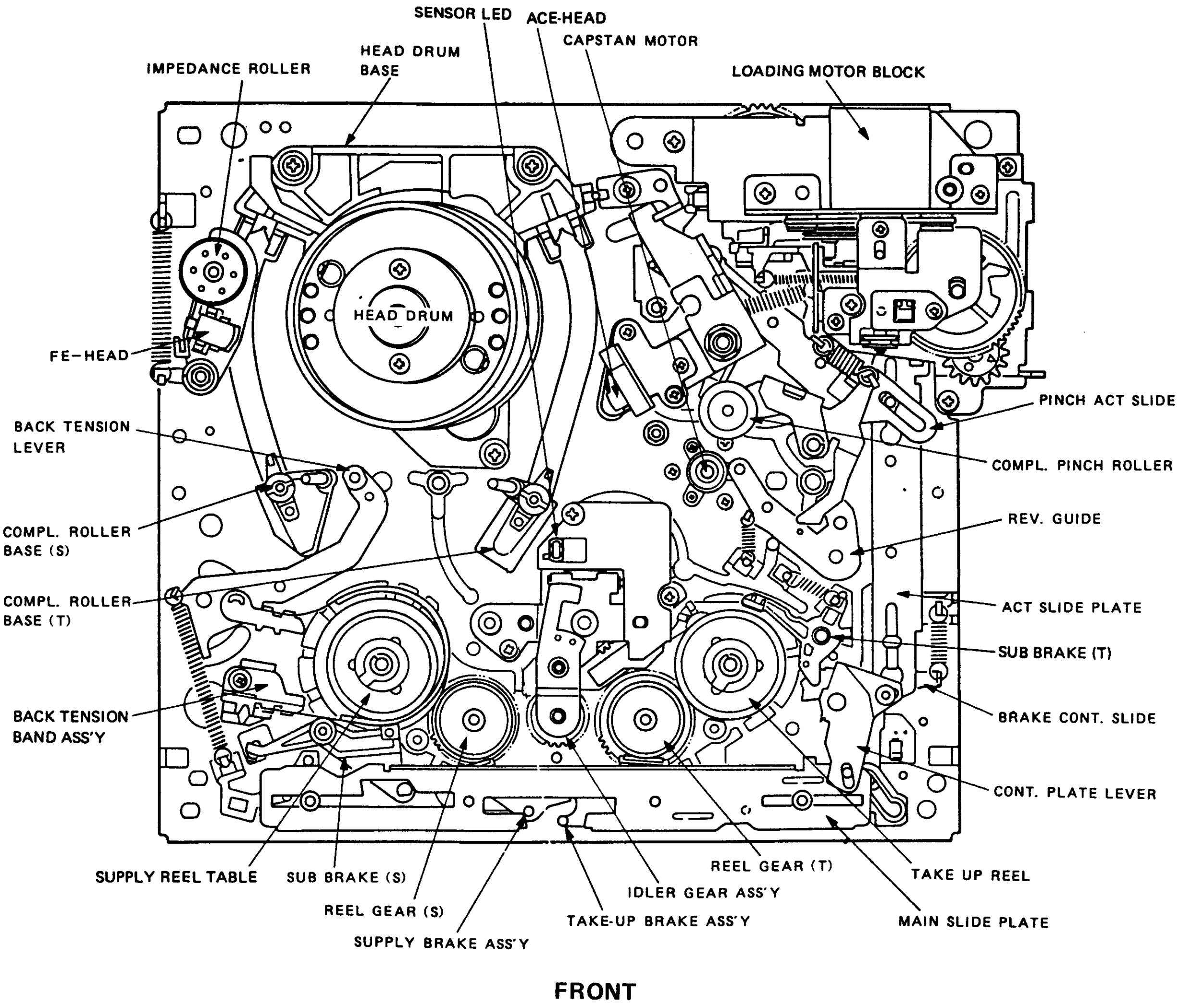
| Mechanism Mode | Mechanism Mode Switch | | | HEX DATA | Function | Main Mode Shifting Conditions | VTR Operation Mode |
|---|---|---|---|---|---|---|---|
| | 3 | 2 | 1 | | | | |
| EJECT | – | – | – | | Eject position |  | EJECT |
| | | | | | ↑<br>Front loading/Unloading<br>↓ | | |
| SHORT REW | – | – | – | | Take up operation in the tape end position | | Detected by FL END switch |
| | | | | | | | |
| INITIAL | 1 | 1 | 1 | ⑦ | Power off position | | Power off when tape is loaded completely |
| | | | | | Tape unloading position<br>↑<br>Tape loading<br>↓<br>Tape loading ending position | | |
| BRAKE | 0 | 0 | 1 | ① | Main brake applying position | | |
| | | | | | | | |
| STOP / FF/REW | 0 | 1 | 0 | ② | STOP waiting and FF/REW (the head motor rotation) | | STOP, FF/REW |
| | | | | | | | |
| STILL | 0 | 1 | 1 | ③ | The positions of STILL, SLOW or F-ADV. | | STILL, SLOW, F-ADV |
| | | | | | | | |
| PLAY | 1 | 0 | 0 | ④ | From FWD direction Normal running mode | | PLAY, REC, F-SEARCH |
| | | | | | | | |
| IDLER | 1 | 0 | 1 | ⑤ | Forward/reverse changeover position | | PAUSE |
| | | | | | | | |
| REV | 1 | 1 | 0 | ⑥ | From REV direction Normal running mode | | R-SERACH |

Detected by FL start switch
Cassette insertion through STOP or PLAY mode
STOP from EJECT
Pre-rolling after detecting tape end with tape end sensor.
Power ON↔OFF when the cassette is inserted completely.
OFF
ON
From PLAY to STOP
From FF/REW to STOP
From SLOW to STOP (or STILL)
From FF to F-SEARCH
From F-SEARCH to FF
PLAY↔STILL
PLAY↔R-SEARCH
From REW to R-SEARCH
From R-SEARCH to REW

Table 2-1

## 2-2. DESCRIPTION OF MECHANISM DRIVE

To realize the thin type mechanism, a loading motor and two pieces of cam (MAIN CAM GEAR and the MODE CAM GEAR) to be driven by the said motor are mounted on the upper part of the capstan motor, that was a dead space in the conventional mechanisms hitherto available with a view to optimization of parts mounting layout. (Fig. 2-1 and Fig. 2-2.)



SENSOR LED
ACE-HEAD
CAPSTAN MOTOR
HEAD DRUM BASE
IMPEDANCE ROLLER
LOADING MOTOR BLOCK
HEAD DRUM
FE-HEAD
PINCH ACT SLIDE
BACK TENSION LEVER
COMPL. PINCH ROLLER
COMPL. ROLLER BASE (S)
REV. GUIDE
COMPL. ROLLER BASE (T)
ACT SLIDE PLATE
SUB BRAKE (T)
BACK TENSION BAND ASS'Y
BRAKE CONT. SLIDE
CONT. PLATE LEVER
SUPPLY REEL TABLE
SUB BRAKE (S)
REEL GEAR (S)
SUPPLY BRAKE ASS'Y
REEL GEAR (T)
IDLER GEAR ASS'Y
TAKE-UP BRAKE ASS'Y
TAKE UP REEL
MAIN SLIDE PLATE
FRONT

Fig. 2-1 TOP VIEW OF MECHANINSM

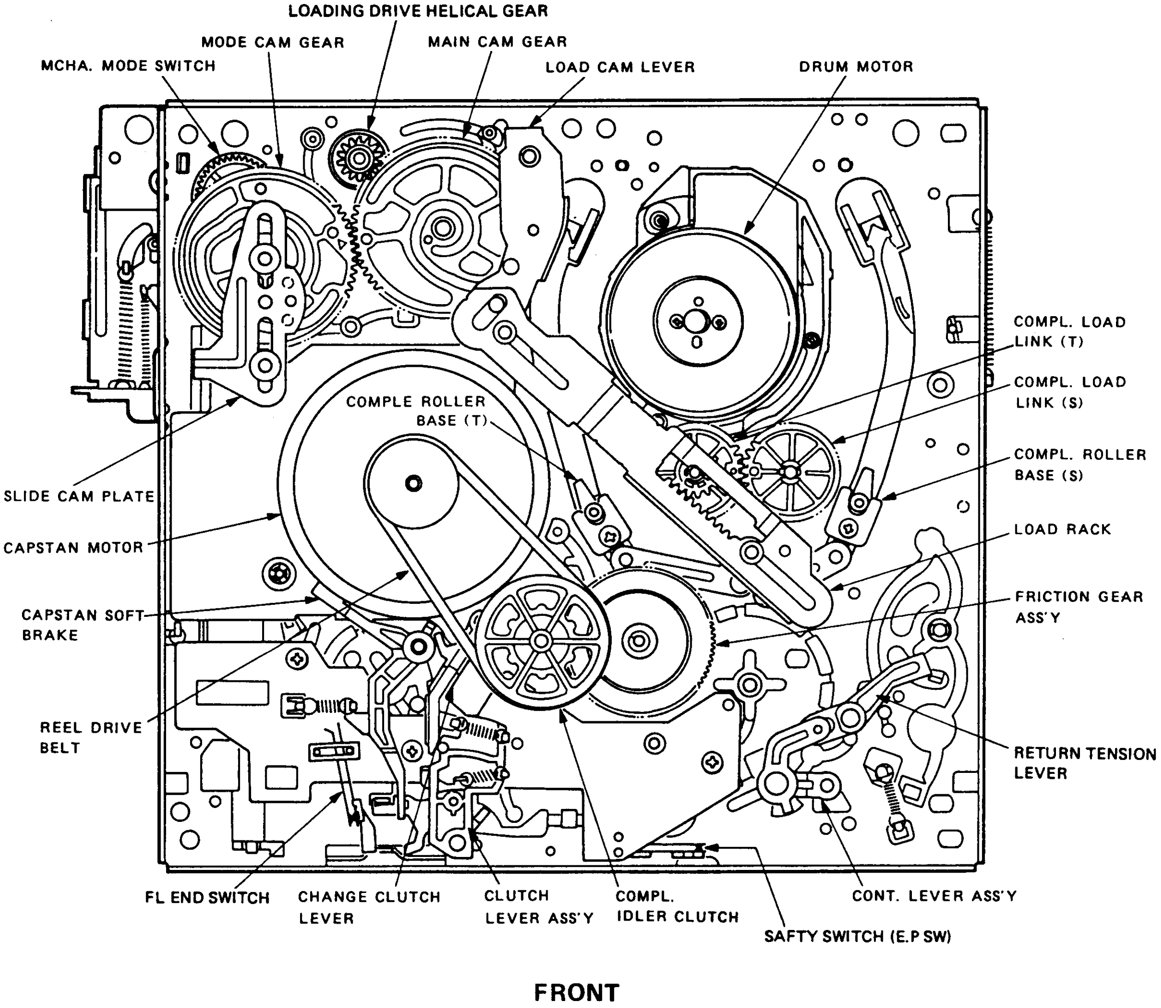

LOADING DRIVE HELICAL GEAR
MODE CAM GEAR
MAIN CAM GEAR
MCHA. MODE SWITCH
LOAD CAM LEVER
DRUM MOTOR
COMPL. LOAD LINK (T)
COMPL. LOAD LINK (S)
COMPLE ROLLER BASE (T)
COMPL. ROLLER BASE (S)
SLIDE CAM PLATE
LOAD RACK
CAPSTAN MOTOR
FRICTION GEAR ASS'Y
CAPSTAN SOFT BRAKE
REEL DRIVE BELT
RETURN TENSION LEVER
FL END SWITCH
CHANGE CLUTCH LEVER
CLUTCH LEVER ASS'Y
COMPL. IDLER CLUTCH
CONT. LEVER ASS'Y
SAFTY SWITCH (E.P SW)
FRONT

Fig. 2-2 BOTTOM VIEW OF MECHANISM

These two cams have one CAM GROOVE on both sides. A total of four CAM GROOVEs performs independent functions to meet the multi-function needs of these days by driving the elements of a wide variety of functions with the motor precisely controlled by a microcomputer.

The two cams are positive motion cams having a groove over 570 degrees. These cams cause the amount of lift to be changed by a mild gradient according to the angle of rotation while synchronizedly being rotated by an outer circumferential gear to alleviate the load exerted on the cams when driving the rod linked with the cams and also to ensure position stability in each mode of operation. The geometry of each cam and that of a metal fitting of the drive section are shown in Fig. 2-3 and Fig. 2-4, respectively. Also, the role of each cam used is described below.

On the GROOVE 3 side of MODE CAM GEAR have a small gear.

This small gear is engaged with the MECHANISM MODE SWITCH as shown in Fig. 2-3., and detect the mechanism operation mode. In this way, the two cams and the MECHANISM MODE SWITCH are rotated synchronously, and the mechanism is fully synchronized and driven for each mode.

MAIN CAM GEAR : CAM GROOVE 1.
Pinch roller pressing operation
CAM GROOVE 2.
Tape loading mechanical drive
MODE CAM GEAR : CAM GROOVE 3.
Brake and clutch selecting operation
CAM GROOVE 4.
Brake control and front unloading control

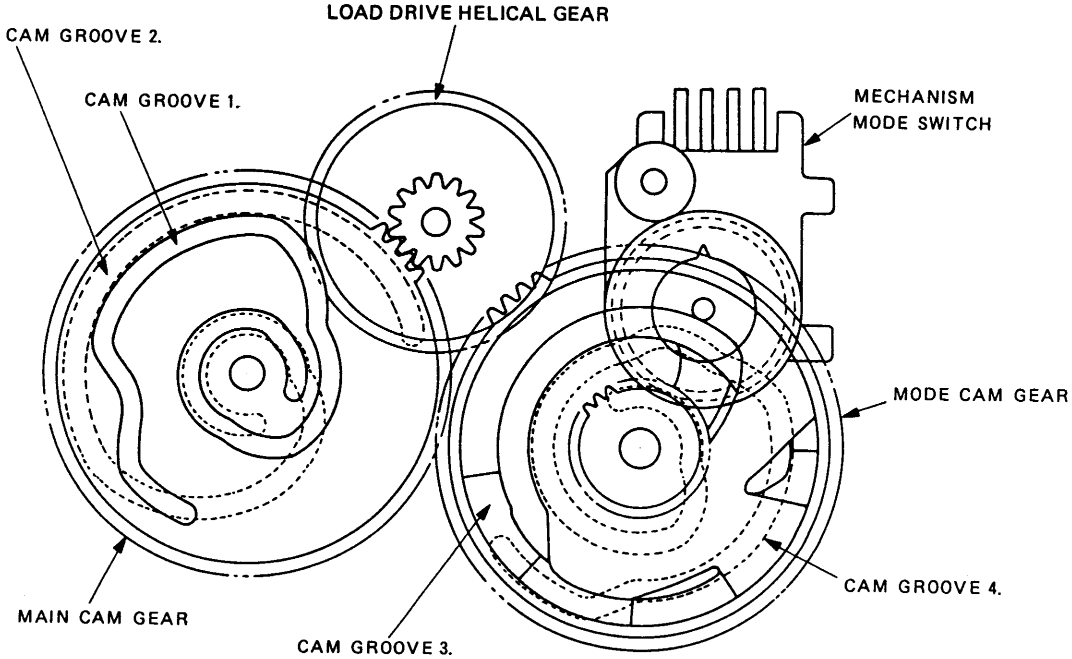


Fig. 2-3 PLAN OF CAMS CONSTRUCTION

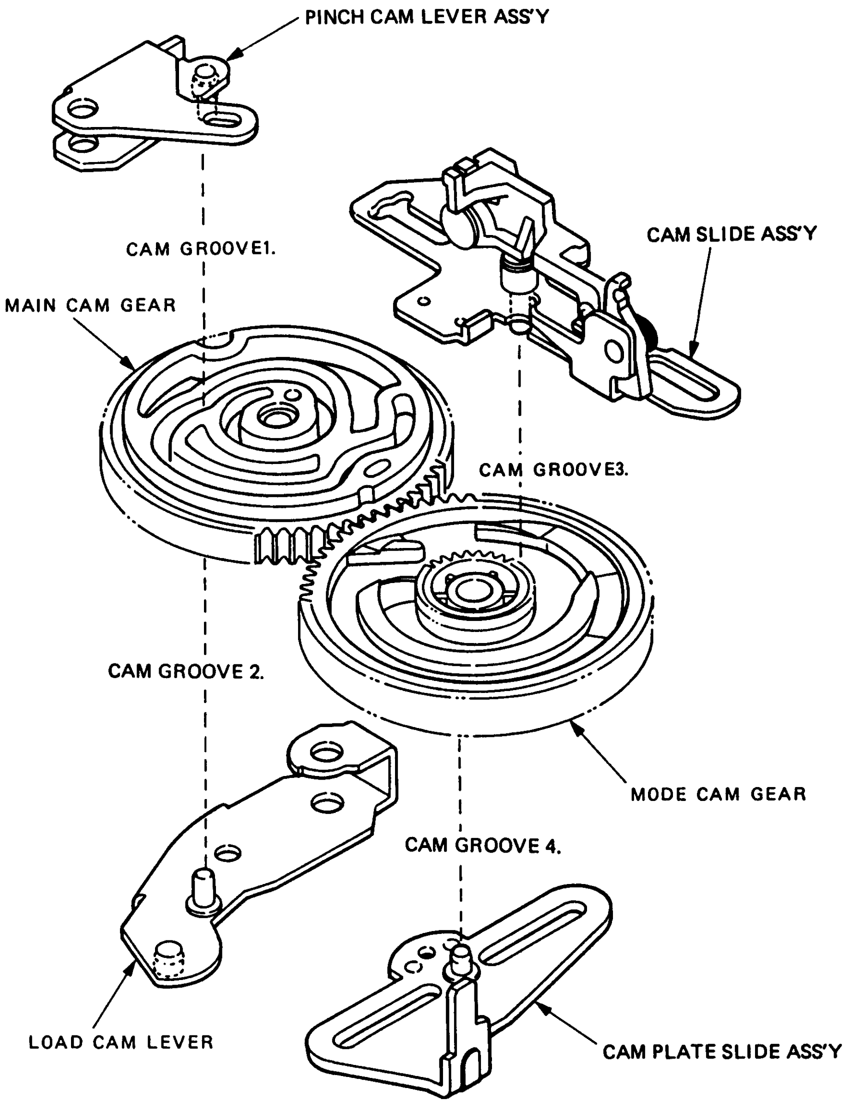

PINCH CAM LEVER ASS'Y
CAM SLIDE ASS'Y
CAM GROOVE1.
MAIN CAM GEAR
CAM GROOVE3.
CAM GROOVE 2.
MODE CAM GEAR
CAM GROOVE 4.
LOAD CAM LEVER
CAM PLATE SLIDE ASS'Y

**Fig. 2-4 VIEW OF CAMS CONSTRUCTION**

### 2-2-1. Tape Loading Mechanism

The tape loading mechanism is compactly designed with use of a LOAD RACK for loading by drive from the before-mentioned MAIN CAMs with CAM GROOVE 2. The LOAD RACK is laid on the dead space in between the DD capstan motor and the head motor for effective space utilization.(Fig. 2-5) The process from tape pull-out upon loading to contact of the leading guide section with the stopper of drum base and press-fitting under tension of spring is guided and driven in such a manner that the rod is drawn inward from the outer circumferential direction of the CAM GROOVE 2, thereby reducing the load torque (PV value) to the CAM GROOVE. And, the load of the loading motor is minimized to enhance reliability.

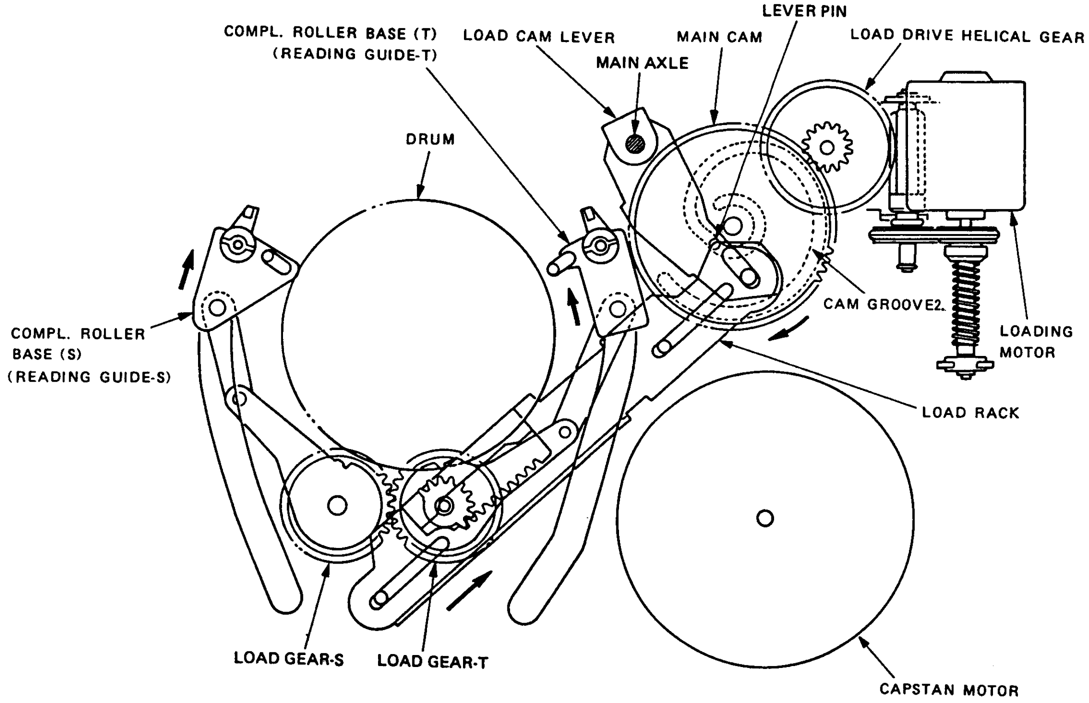

LEVER PIN
COMPL. ROLLER BASE (T) (READING GUIDE-T)
LOAD CAM LEVER
MAIN CAM
LOAD DRIVE HELICAL GEAR
MAIN AXLE
DRUM
COMPL. ROLLER BASE (S) (READING GUIDE-S)
CAM GROOVE2.
LOADING MOTOR
LOAD RACK
LOAD GEAR-S
LOAD GEAR-T
CAPSTAN MOTOR

Fig. 2-5 CONSTRUCTION OF TAPE LOADING MECHANISM

### 2-2-2. Pinch Roller Pressing Mechanism

The PINCH LEVER assembly of the pinch roller is operated by the PINCH CAM LEVER (rod) driven by the CAM GROOVE 1 of the before-mentioned MAIN CAM, and then press-fitted to the capstan. The revolving tape guide (REV.GUIDE) is interlockingly operated with the PINCH LEVER assembly to ensure stable tape running at a fixed speed. (Fig. 2-6)

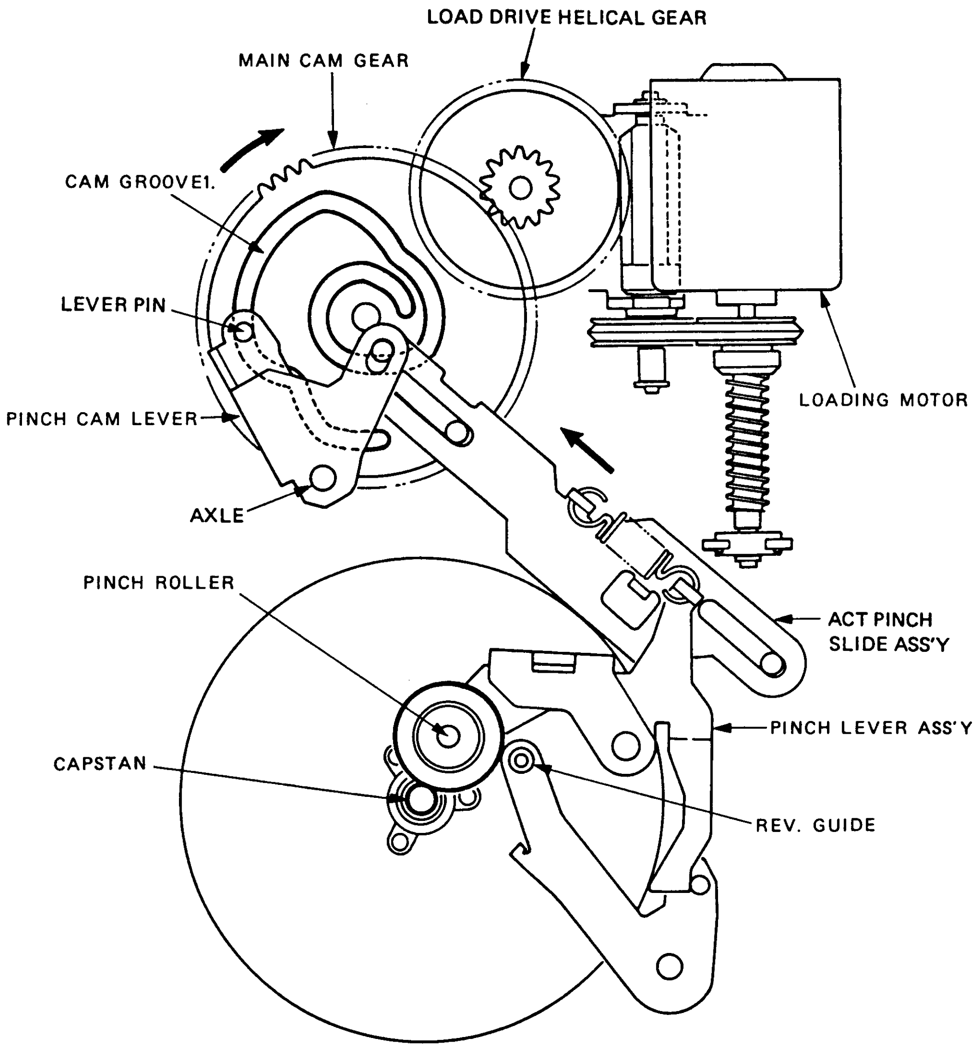

LOAD DRIVE HELICAL GEAR
MAIN CAM GEAR
CAM GROOVE1.
LEVER PIN
PINCH CAM LEVER
AXLE
LOADING MOTOR
ACT PINCH SLIDE ASS'Y
PINCH ROLLER
PINCH LEVER ASS'Y
CAPSTAN
REV. GUIDE

Fig. 2-6 CONSTRUCTION OF PINCH ROLLER MECHANISM

### 2-2-3. Operation of Brake Control Plate

The ACT SLIDE PLATE and the MAIN SLIDE PLATE shown in Fig. 2-7 is driven by the CAM GROOVE 4 of the MODE CAM GEAR for precise control of operations including the control of back tension lever, auxiliary brake (SUB BRAKE S/T), main brake (SUPPLY BRAKE and TAKE-UP BRAKE), clutch selection, FL END SWITCH selection, and drive selection of front loading mechanism.

Also, the mechanism mode switch is engaged with the small gear of the MODE CAM GEAR for sync rotation. At the time, the detection position of each mode is set so that it becomes the flat section at the cam curve of the CAM GROOVE 4 of the MODE CAM GEAR. So, even if motor stop time deviation occurs due to the load following the detection of the loading motor stop position, the control plate linked with a stop in the specified position.

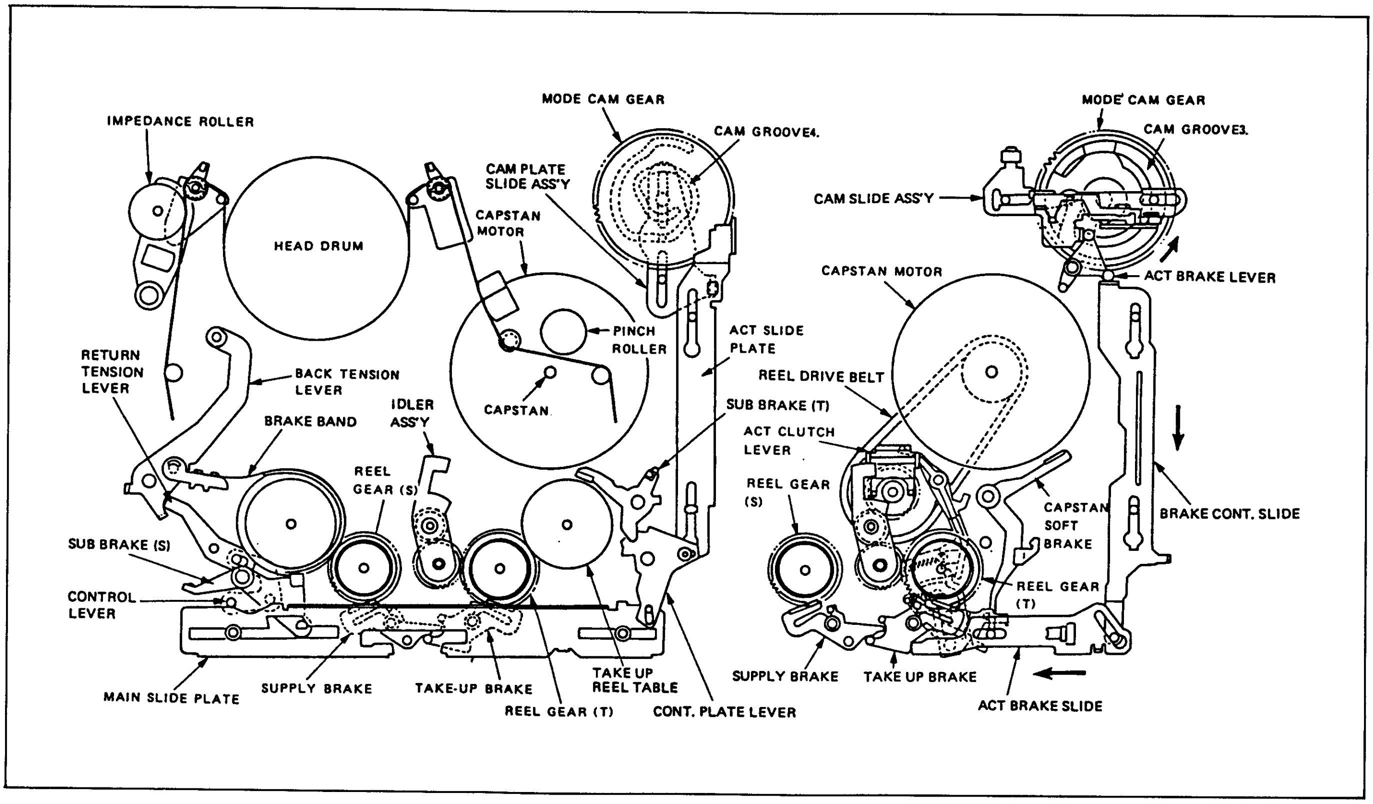

MODE CAM GEAR
IMPEDANCE ROLLER
CAM GROOVE4.
CAM PLATE SLIDE ASS'Y
CAPSTAN MOTOR
HEAD DRUM
PINCH ROLLER
RETURN TENSION LEVER
BACK TENSION LEVER
CAPSTAN
IDLER ASS'Y
BRAKE BAND
REEL GEAR (S)
SUB BRAKE (S)
CONTROL LEVER
MAIN SLIDE PLATE
SUPPLY BRAKE
TAKE-UP BRAKE
TAKE UP REEL TABLE
REEL GEAR (T)
CONT. PLATE LEVER
MODE CAM GEAR
CAM GROOVE3.
CAM SLIDE ASS'Y
ACT BRAKE LEVER
CAPSTAN MOTOR
ACT SLIDE PLATE
REEL DRIVE BELT
SUB BRAKE (T)
ACT CLUTCH LEVER
REEL GEAR (S)
CAPSTAN SOFT BRAKE
BRAKE CONT. SLIDE
REEL GEAR (T)
SUPPLY BRAKE
TAKE UP BRAKE
ACT BRAKE SLIDE

Fig. 2-7 CONSTRUCTION OF BRAKE CONTROL PLATE (AT REW/FF, STOP MODE)

### 2-2-4. Brake Control Mechanism

The mechanical logic of the brake state is shown in Fig. 2-8. The brake which damps the reel rotation is operated by the BRAKE CONTROL SLIDE driven from the CAM GROOVE 3 of the MODE CAM GEAR.

Also, to alleviate damage to the tape caused by high tension of the brake in operation, the tape is stopped after brake operation and the shape is thoughtfully designed for proper biting-in ratio of the left and the right brakes after-mentioned to each other.

This enables the supply brake to be released by the operation of the above-mentioned MAIN SLIDE PLATE after an elapse of prefixed slight time to reduce the tape tension to zero, and to provide the tape with a proper degree of looseness. As a result, a slight gap is created in the tape from the HEAD DRUM.

Further, a momentary still mechanism which dispenses with use of a plunger solenoid is not provided as one of design features of the P-88 mechanism.

To stabilize the image in an extremely short period of time during a shift to the STILL mode from the PLAY mode, the auxiliary brake (CAPSTAN SOFT BRAKE) is press-fit to the outer circumference of the capstan motor by the before-mentioned CAM GROOVE 3 of the MODE CAM GEAR.

These operations is interlocked with the operation of the before-mentioned ACT SLIDE PLATE and the MAIN SLIDE PLATE. It consists of one MODE CAM for offsetting the operating position.

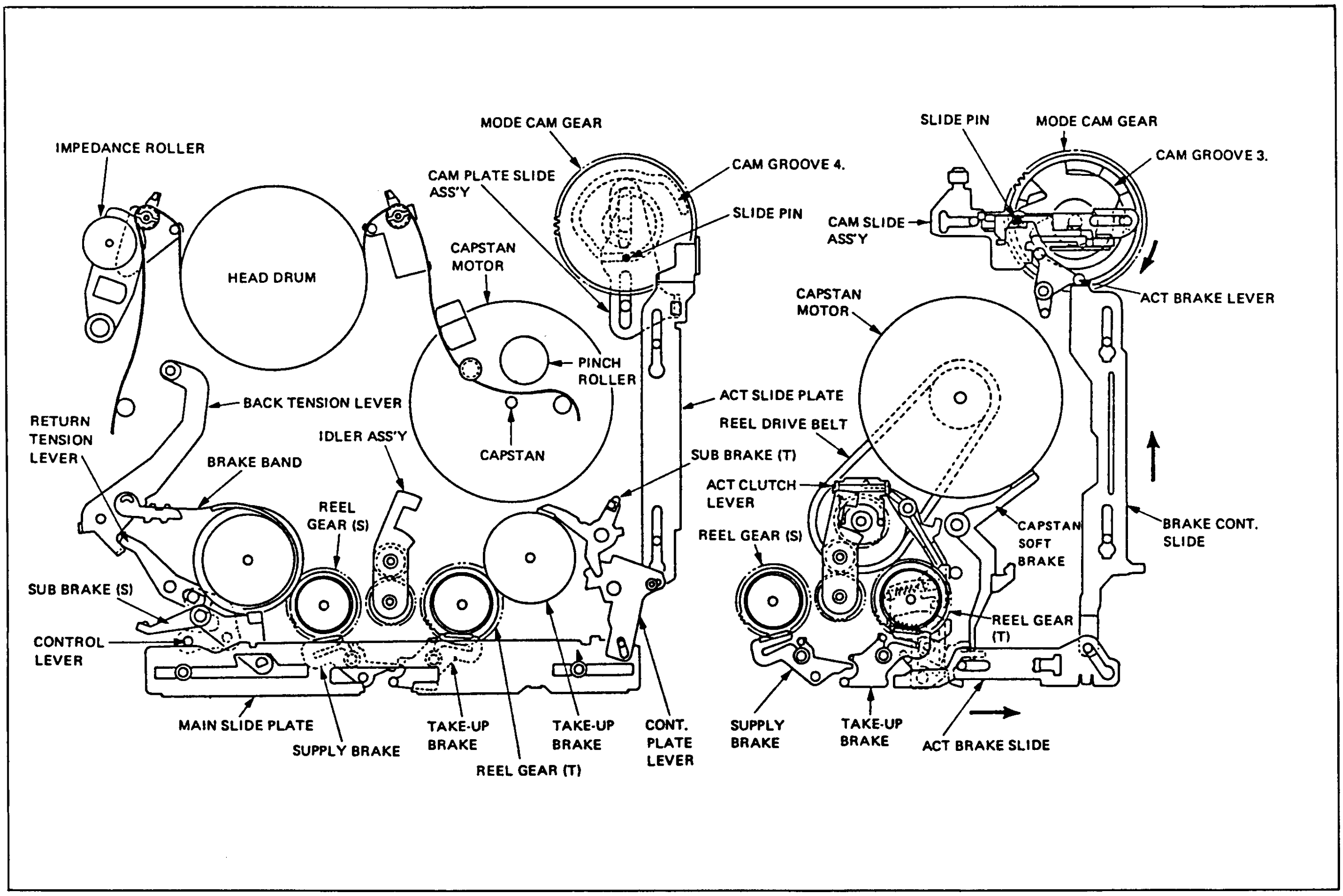

MODE CAM GEAR
IMPEDANCE ROLLER
CAM PLATE SLIDE ASS'Y
CAM GROOVE 4.
SLIDE PIN
CAPSTAN MOTOR
HEAD DRUM
PINCH ROLLER
BACK TENSION LEVER
RETURN TENSION LEVER
IDLER ASS'Y
CAPSTAN
BRAKE BAND
REEL GEAR (S)
SUB BRAKE (S)
CONTROL LEVER
MAIN SLIDE PLATE
SUPPLY BRAKE
TAKE-UP BRAKE
TAKE-UP BRAKE
REEL GEAR (T)
CONT. PLATE LEVER
ACT SLIDE PLATE
REEL DRIVE BELT
SUB BRAKE (T)
ACT CLUTCH LEVER
REEL GEAR (S)
SLIDE PIN
MODE CAM GEAR
CAM GROOVE 3.
CAM SLIDE ASS'Y
CAPSTAN MOTOR
ACT BRAKE LEVER
CAPSTAN SOFT BRAKE
BRAKE CONT. SLIDE
REEL GEAR (T)
SUPPLY BRAKE
TAKE-UP BRAKE
ACT BRAKE SLIDE

Fig. 2-8 CONSTRUCTION OF BRAKE CONTROL PLATE (AT BRAKE MODE)

### 2-2-5. Brake Lock Release Mechanism (FF/REW→STOP Mode)

The brake lock momentary release mechanism is shown in Fig. 2-9 ⓐ, ⓑ and Fig. 2-10.

In the FF/REW mode (Fig. 2-9 ⓐ) mechanical elastic load is given to the BRAKE LOCK LEVER mounted on the BRAKE CAM SLIDE which causes the brake to operate, and it is locked to the high-speed rotary axle of the 1st reducing section of the loading motor.

ⓐChanges from brake mode or lock released state to FF/REW, STOP mode.

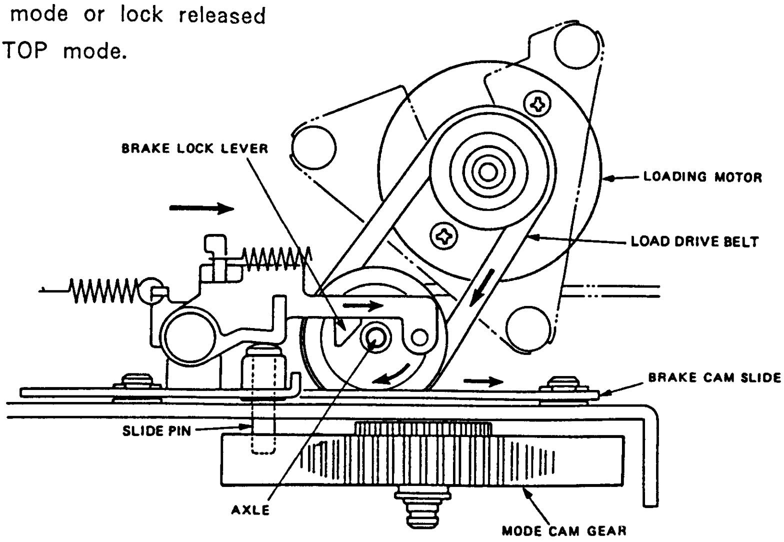

BRAKE LOCK LEVER
LOADING MOTOR
LOAD DRIVE BELT
BRAKE CAM SLIDE
SLIDE PIN
AXLE
MODE CAM GEAR

Fig. 2-9 ⓐ BRAKE LOCK & RELEASE MECHANISM

At the time of a shift to the STOP mode from the FF/REW (Fig. 2-9 ⓑ), the BRAKE LOCK LEVER releases the lock on slight rotation of the axle by contact between the rotary shaft and the friction resistance so that the brake can be instantaneously applied to the reel. The lock release speed is almost the same as the start-up of the loading motor. So, the its response to the brake is very quick, and construction is simplified also.

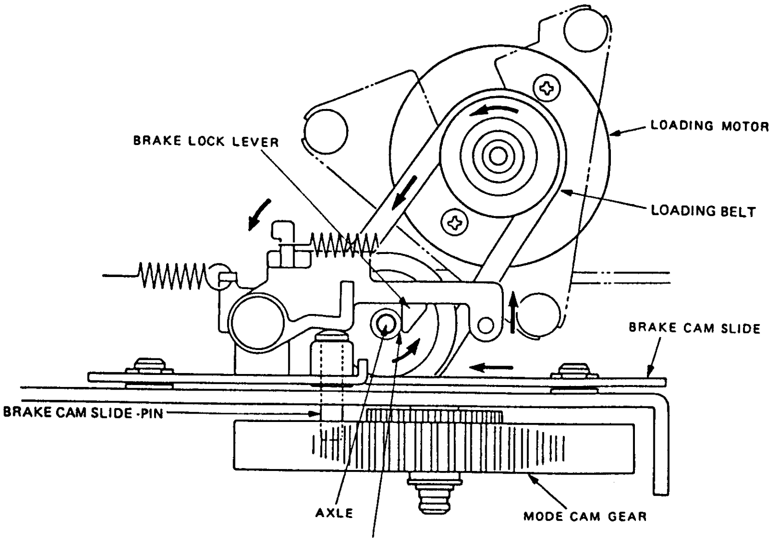

BRAKE LOCK LEVER
LOADING MOTOR
LOADING BELT
BRAKE CAM SLIDE
BRAKE CAM SLIDE -PIN
AXLE
MODE CAM GEAR
Lock is released by the frictional resistance of an elastic load.

Fig. 2-9 ⓑ BRAKE LOCK & RELEASE MECHANISM

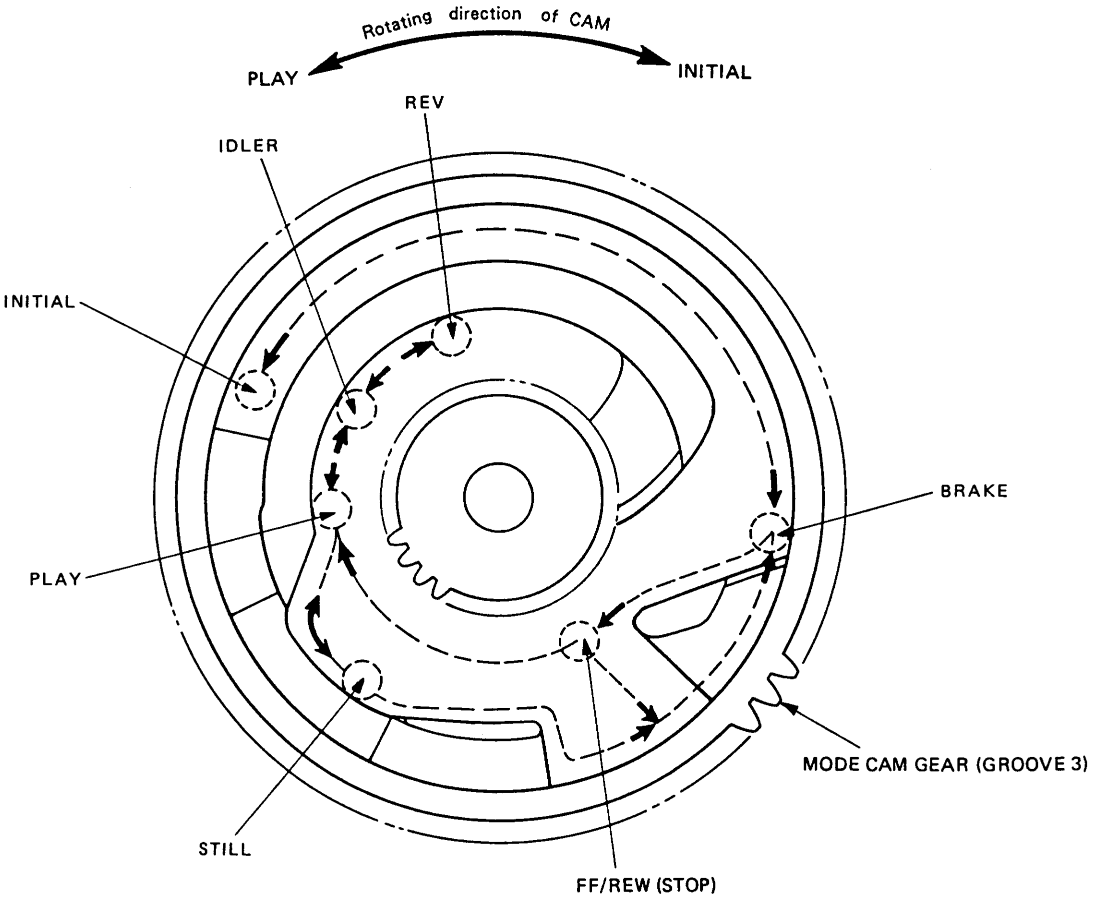

Rotating direction of CAM
PLAY
INITIAL
REV
IDLER
INITIAL
BRAKE
PLAY
MODE CAM GEAR (GROOVE 3)
STILL
FF/REW (STOP)

Fig. 2-10 POSITIONING OF BRAKE CAM SLIDE-PIN ON THE GROOVE 3 OF MODE CAM GEAR

## 2-3. REEL TABLE DRIVE

### 2-3-1. Reel Table Drive Mechanism

This mechanism employs the system of driving the tape from the DD capstan motor via rubber belt. In the tape constant speed running mode for PLAY, F-SEARCH, and R-SEARCH, the capstan and the pinch roller are press-fitted to allow the tape to run at a constant speed. By providing a FRICTION MECHANISM in between the capstan motor and the reel table, the tape is taken up. In the FF/REW tape high-speed take-up mode, the capstan and the pinch roller are separated from each other, and the capstan motor and the reel table are linked direct by the clutch mechanism to carry out tape take-up. Also, to realize a thin type reel table drive section, the mechanism is simplified and the rotary parts are thinned for realization of physically compact design, and a step is provided on the reel table mounting section of the chassis by high-precision drawing process. A simplified figure of the drive mechanism is shown in Fig. 2-11 and Fig. 2-12. Power transmission to the pulley of the clutch mechanism section is done from the DD capstan motor via rubber belt.

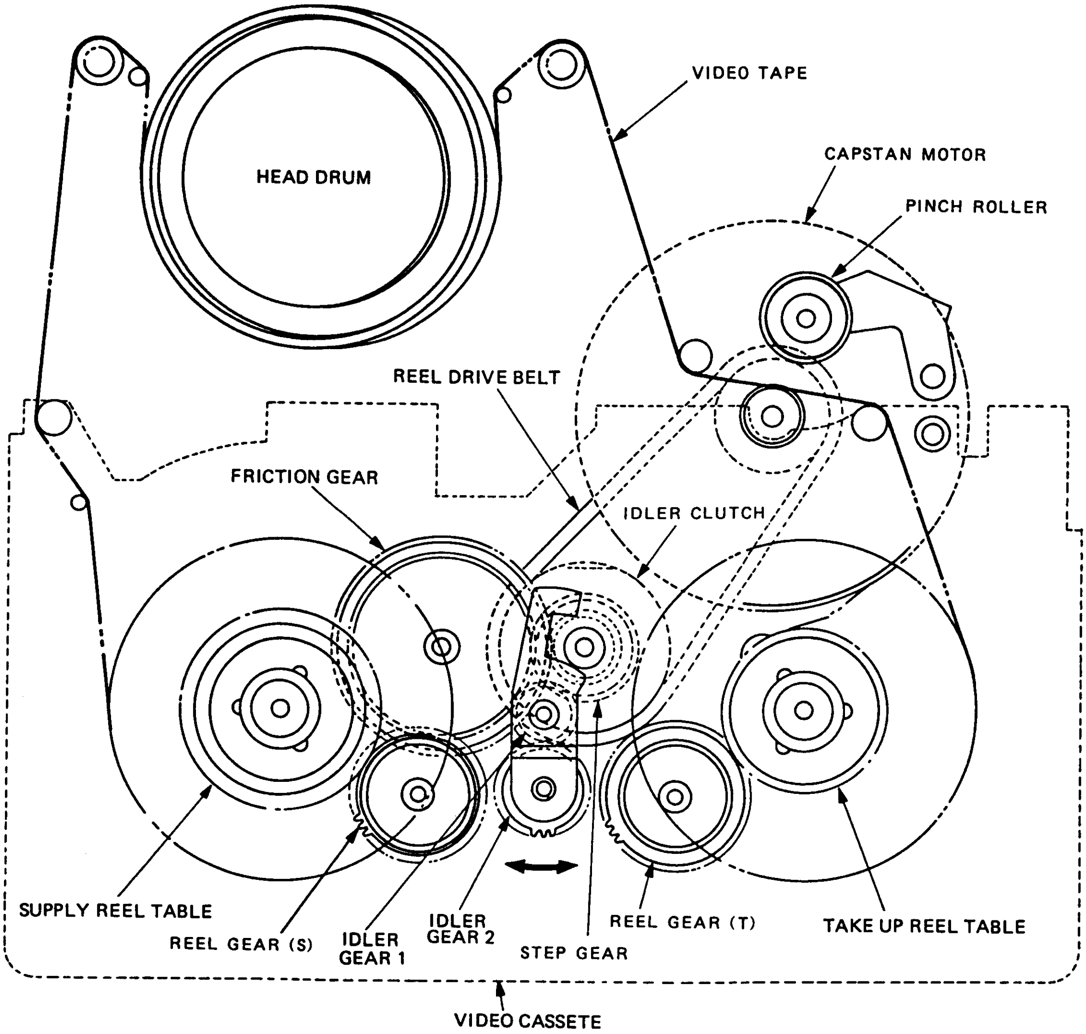
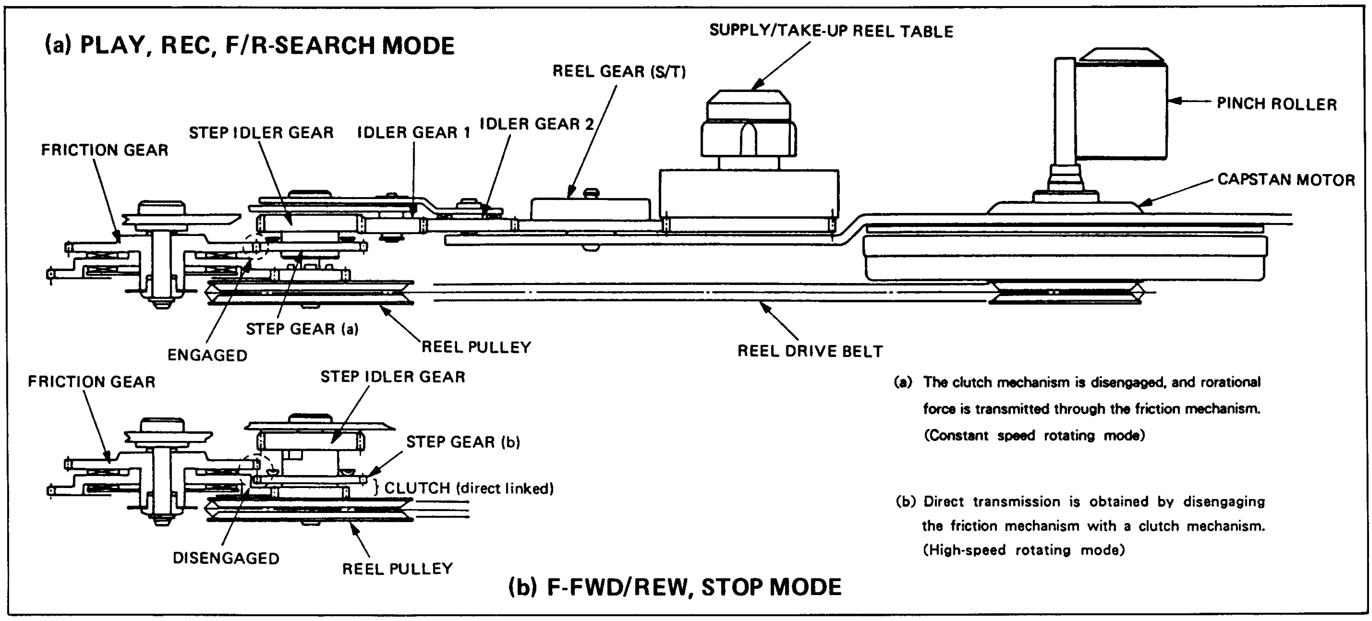

HEAD DRUM
VIDEO TAPE
CAPSTAN MOTOR
PINCH ROLLER
REEL DRIVE BELT
FRICTION GEAR
IDLER CLUTCH
SUPPLY REEL TABLE
REEL GEAR (S)
IDLER GEAR 1
IDLER GEAR 2
STEP GEAR
REEL GEAR (T)
TAKE UP REEL TABLE
VIDEO CASSETE

Fig. 2-11 REEL TABLE DRIVE

At that time, the reel table winding speed and the torque needed in a wide variety of modes are obtained by shifting the up and down STEP GEAR positioned at the upper section of pulley. The selection of the STEP GEAR is precision controlled by the MODE CAM GEAR via the BRAKE CONTROL SLIDE. With the up and down STEP GEAR down, the clutch mechanism is direct linked, and the transmission power from the capstan motor is sent to the reel table via IDLER GEAR assembly and REEL GEAR (S/T). On the other hand, FRICTION MECHANISM acts between the pulley and the STEP GEAR when the up and down STEP GEAR are in the elevated state, thereby controlling the transmission torque for generation of the take-up slip. Normally, it is desirable that the take-up torque of the reel table is higher in the R-SEARCH mode than that in the PLAY mode. This is because in the forward tape running the tape winding load to the HEAD DRUM has to be taken care of the capstan and the pinch roller.

While, in the reverse tape running mode the winding load has to be taken on the take-up reel table. In the special playback operation, a mechanism for varying the take-up torque of the reel table is required to be changed depending upon the running direction of the tape. But in this mechanism, the torque selection is made by varying the reduction speed ratio up to the reel table from the capstan motor on both the forward side and the reverse side of the tape. Also, design simplification of the selection mechanism is realized by using a single friction mechanism. In other words, the take-up torque necessary for forward/reverse rotation is obtained by controlling the capstan motor speed. Rotation speed and torque needed for each mode of operation are converted by clutch mechanism for transmission of the drive power to the idler mechanism. The left and right moving IDLER GEAR assembly is automatically rotated to the left and the right according to the direction of capstan motor rotation by using the friction force. Because the mechanism is so designed as to drive the reel table of the side on which the tape is transported by the capstan and pinch roller, the forward and reverse constant speed drive (the PLAY, REC, F/R SEARCH modes) is carried out in the state in which the FRICTION MECHANISM is being operated (Fig. 2-12 ⓐ) On the other hand, in the condition in which the friction mechanism is not in operation, the forward/reverse high speed drive (FF/REW mode) is made possible (Fig. 2-12 ⓑ). Also, the reel drive in all modes is taken care of by the single left and right moving idler for design simplification.

The idler body employs gear drive to improve reliability with a view to realizing parts thinning while securing the transmission reliability. Using a resin molded gear as material of an idler, the efficiency of the entire reel drive system has been improved because there are no deformation and loss, and minimized rotation moving torque necessary for biting-in as in the case of a material such as rubber which shows considerable elastic deformation, etc. Further in this mechanism, an intermediate gear is provided in between the reel side and the idler to minimize the rotating and moving angle of the left and right moving idlers, thereby holding the reversing time to a minimum when shifting to the tape running direction change mode. This results in significantly reduced possibility of tape looseness.


(a) PLAY, REC, F/R-SEARCH MODE

(b) F-FWD/REW, STOP MODE

(a) The clutch mechanism is disengaged, and rorational force is transmitted through the friction mechanism. (Constant speed rotating mode)

(b) Direct transmission is obtained by disengaging the friction mechanism with a clutch mechanism. (High-speed rotating mode)

Fig. 2-12 REEL TABLE DRIVE (SIDE VIEW)

### 2-3-2. Reel Table Drive Clutch Lock and Release Mechanism

As described in the preceding section, using the selection of the step gear (CLUTCH MECHANISM), two mechanisms which are driven by being selected via direct drive or via FRICTION MECHANISM from the capstan motor, to execute the reel table drive. The operating status of the clutch lock and the releasing mechanism is shown in Fig. 2-13.

Fig. 2-13 ① shows the tape unloading position (INITIAL position) when the power for the mechanism operating mode is switched off.

At that times all the levers are in the initial positions, and the clutch is released also so that a route for reel table drive is created via a friction mechanism.

Fig. 2-13 ② shows that the mechanism operation mode has executed the tape loading and that it has completed its movement to the STOP (stand-by), FF/REW position.

At this time, the CLUTCH ACT LEVER is operated by the hook of the ACT BRAKE SLIDE to move the ACT CLUTCH LEVER in the direction of arrow via the CLUTCH LEVER and the CLUTCH CHANGE LEVER. Now, the up and down STEP GEAR is placed into the direct coupled state. In the FF/REW mode, the reel table is directly driven so that the rotation of the capstan motor is directly transmitted to make high-speed rotation drive possible. When shifting the mode to the STOP from the FF/REW in this condition, the mechanism mode position is once moved back to the brake position, and when the reel table brake is instantaneously applied, the clutch is released once at the same time, after which it returns to the same mechanism mode as the FF/REW mode once again. Now, it is placed in a waiting state in the same condition of the STOP mode as shown in Fig. 2-13 ②.

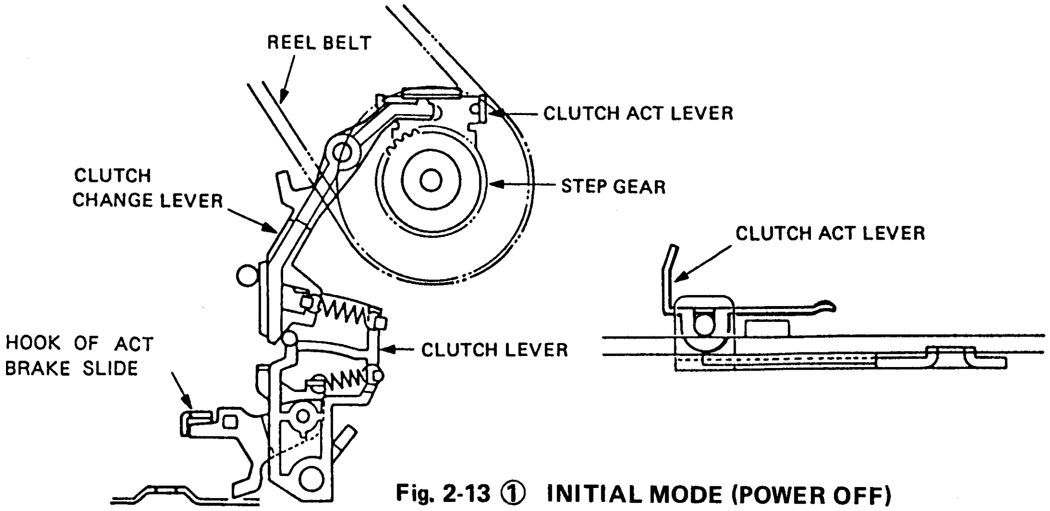

REEL BELT
CLUTCH ACT LEVER
STEP GEAR
CLUTCH CHANGE LEVER
CLUTCH ACT LEVER
HOOK OF ACT BRAKE SLIDE
CLUTCH LEVER

Fig. 2-13 ① INITIAL MODE (POWER OFF)

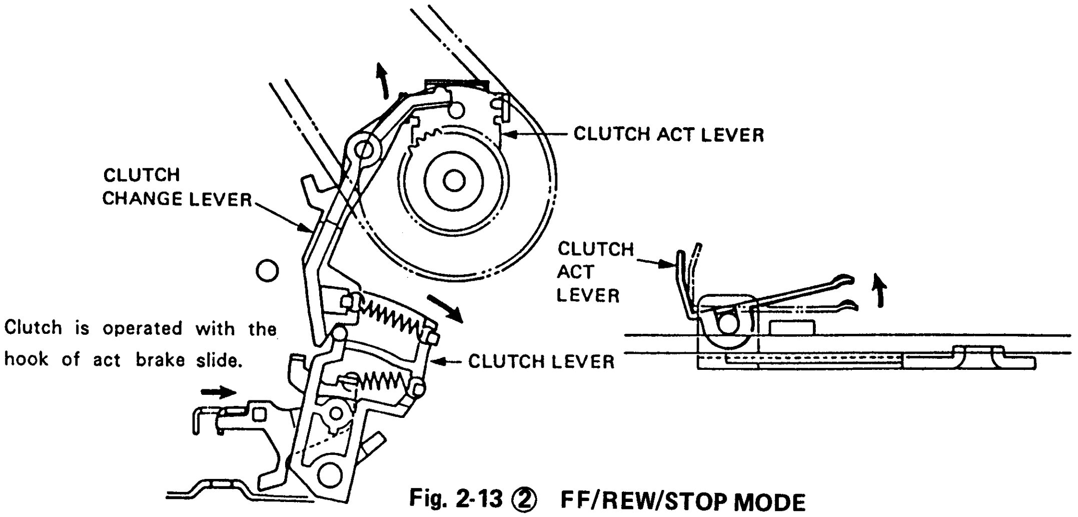

CLUTCH ACT LEVER
CLUTCH CHANGE LEVER
CLUTCH ACT LEVER
Clutch is operated with the hook of act brake slide.
CLUTCH LEVER

Fig. 2-13 ② FF/REW/STOP MODE

Fig. 2-13 ① – ③ REEL TABLE DRIVE CLUTCH LOCK AND RELEASE MECHANISM

Fig. 2-13 ③ shows the completion state of a shift to the PLAY mode via the STILL mode from the STOP (FF/REW) mode for the mechanism mode position.
In the case of this mode shifting, the movement of the BRAKE ACT SLIDE remains fixed. So, the CLUTCH ACT LEVER should be unlocked by the movement of the hook of the MAIN SLIDE PLATE to cause the clutch to be released. This movement in turn causes the capstan motor rotation to be transmitted via the friction mechanism. So, the constant speed rotation drive necessary for the PLAY (REC) mode and SEARCH mode is made possible.

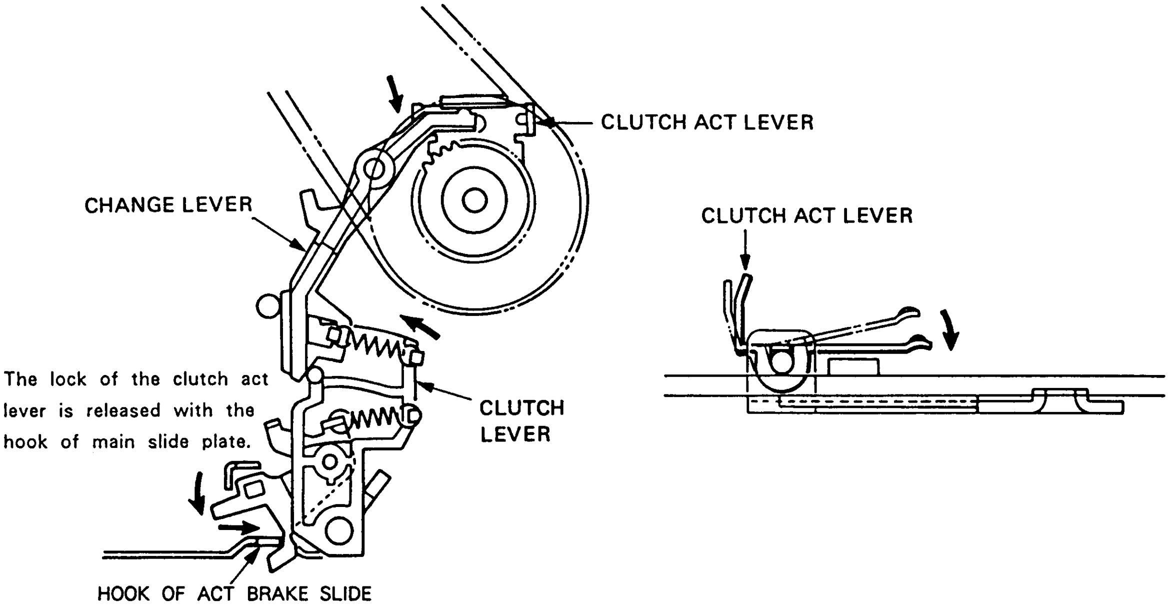

CLUTCH ACT LEVER
CHANGE LEVER
CLUTCH ACT LEVER
The lock of the clutch act lever is released with the hook of main slide plate.
CLUTCH LEVER
HOOK OF ACT BRAKE SLIDE

**Fig. 2-13 ③ FF/REW/STOP MODE → STILL MODE → PLAY MODE**

## 2-4. FRONT LOADING DRIVE SELECTION MECHANISM

In the P-88 mechanism, the motor dedicated to the use of front loading is not employed. The drive source is utilized instead of the tape loading motor. As shown in Fig. 2-14 ⓐ/ⓑ, during the front loading the FRONT LOAD WORM GEAR directly coupled to the tape loading motor axle and the FRONT HELICAL GEAR with several teeth missing are engaged with each other and rotated for transmission of the drive force to the front loading mechanism. When the cassette tape is inserted completely in the mechanism, the FRONT HELICAL GEAR is automatically disengaged from the FRONT LOAD WORM GEAR. After that, the tape loading operation is performed without the tape loading motor drive force being transmitted to the front loading mechanism.

While the drive force is being transmitted to the front loading mechanism, the CAM GROOVEs of the before-mentioned MAIN CAM GEAR and the MODE CAM GEAR are flat in cam line pattern. These are therefore held without changing the mode state of the mechanism in any way.

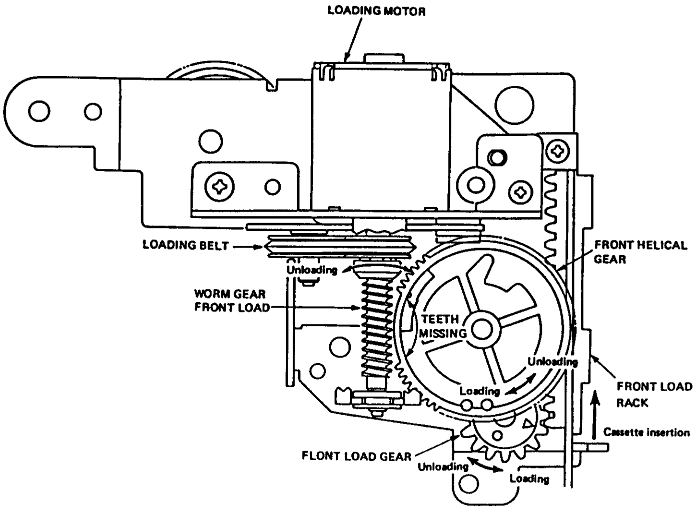

LOADING MOTOR
LOADING BELT
Unloading
WORM GEAR FRONT LOAD
TEETH MISSING
FRONT HELICAL GEAR
Unloading
Loading
FRONT LOAD RACK
Cassette insertion
FLONT LOAD GEAR
Unloading
Loading

Fig. 2-14 ⓐ FRONT LOADING DRIVE SELECTION MECHANISM (CASSETTE INSERTED POSITION)

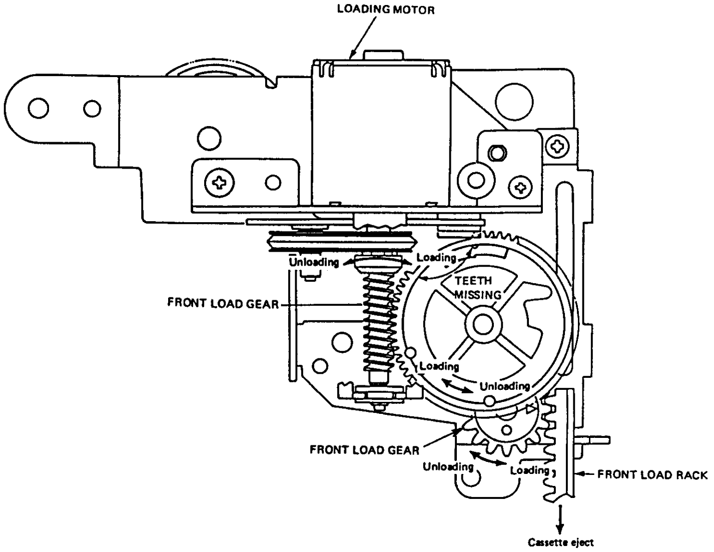

LOADING MOTOR
Unloading
Loading
TEETH MISSING
FRONT LOAD GEAR
Loading
Unloading
FRONT LOAD GEAR
Unloading
Loading
FRONT LOAD RACK
Cassette eject

Fig. 2-14 ⓑ FRONT LOADING DRIVE SELECTION MECHANISM (CASSETTE EJECTED POSITION)

**(A) Cassette inserting operation**

When inserting a cassette from the cassette ejected state of Fig. 2-14 ⓑ, the FL START SWITCH shown in Fig. 2-15 is turned OFF, to cause the loading motor to be rotated in the direction of insetting. As a result, the FRONT LOAD RACK is drawn in, and the front loading is made up to the cassette tape completion point. So, it is locked in the grooves shown in Fig. 2-15 to complete cassette inserting. At that time, the FRONT HELICAL GEAR is positioned at ⓐ of Fig. 2-14, and is released from the front loading mechanism, therefore, the tape loading operation is continuously performed.

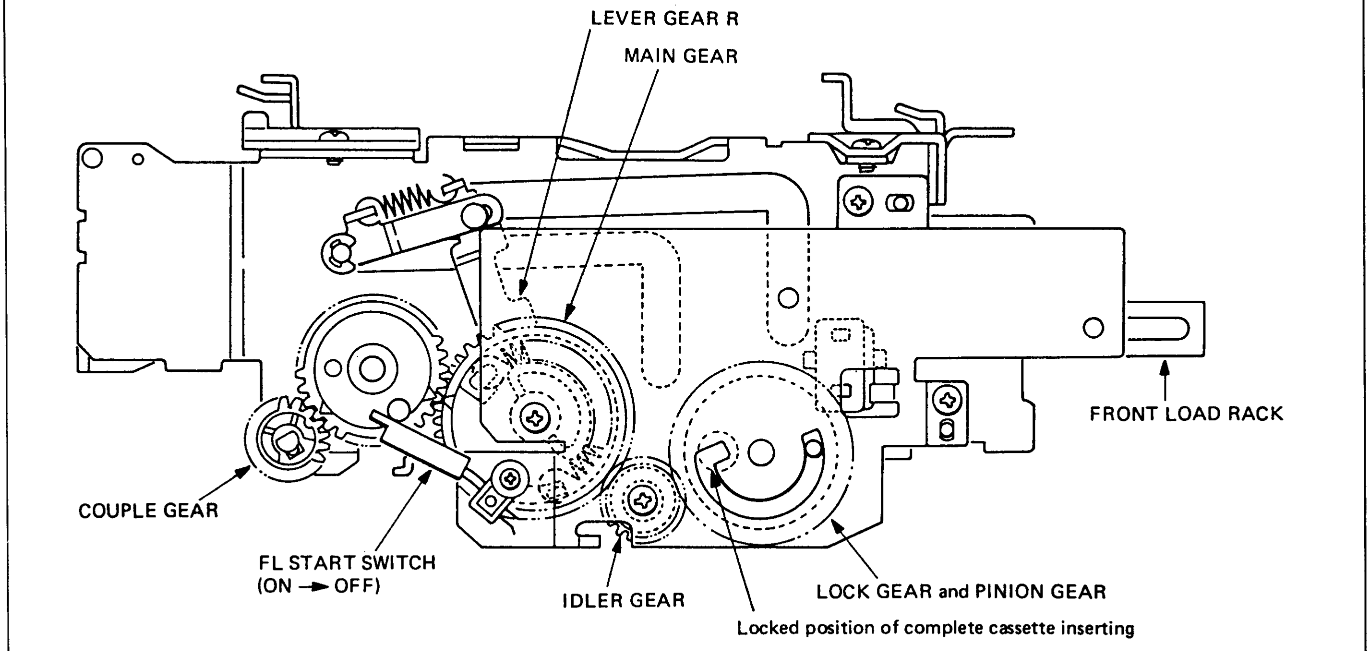

LEVER GEAR R
MAIN GEAR
FRONT LOAD RACK
COUPLE GEAR
FL START SWITCH
(ON → OFF)
IDLER GEAR
LOCK GEAR and PINION GEAR
Locked position of complete cassette inserting

Fig. 2-15 CASSETTE HOLDER MECHANISM (CASSETTE INSERTING OPERATION)

**(B) Cassette ejection operation**

The components of the front loading mechanism is shown in Fig. 2-16.

When ejecting the cassette from the inserted state shown in Fig. 2-14 ⓐ, the FRONT ACT LEVER is pushed in the direction of arrow due to the ACT SLIDE PLATE moves in the direction of arrow shown in Fig. 2-17. As a result, the FRONT LEVER assembly is turned counterclockwise via the FRONT LOAD SLIDE to cause the FRONT HELICAL GEAR to be engaged with the FRONT LOAD WORM GEAR of the loading motor. At that time, the loading motor is being rotated counterclockwise, so that the FRONT HELICAL GEAR is caused to be rotated counterclockwise also to carry out the front unloading via the FRONT LOAD GEAR and the FRONT LOAD RACK. At the same time, the FRONT ACT LEVER is operated counterclockwise by the hook of the FRONT HELICAL GEAR. This releases the lock being pushed in the direction of arrow indicated by the ACT SLIDE PLATE. So, the FRONT LOAD SLIDE assembly now moves to the initial position to prepare for the next ejection operation. Incidentally, the movement of the FRONT LEVER assembly performs an important function of positioning the FRONT HELICAL GEAR (Fig. 2-14 ⓐ) upon completion of cassette mounting, in addition to the cassette eject start-up operation.

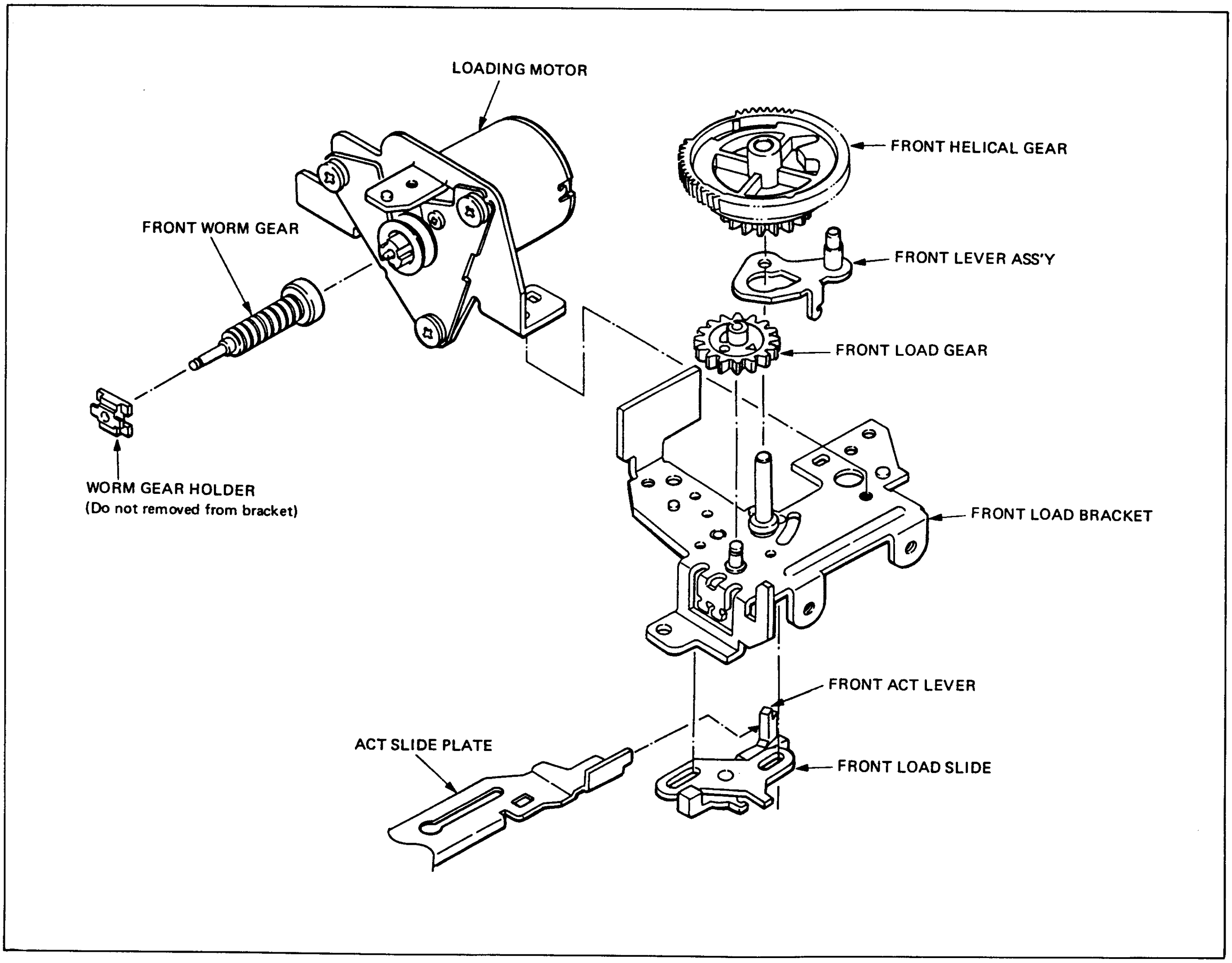
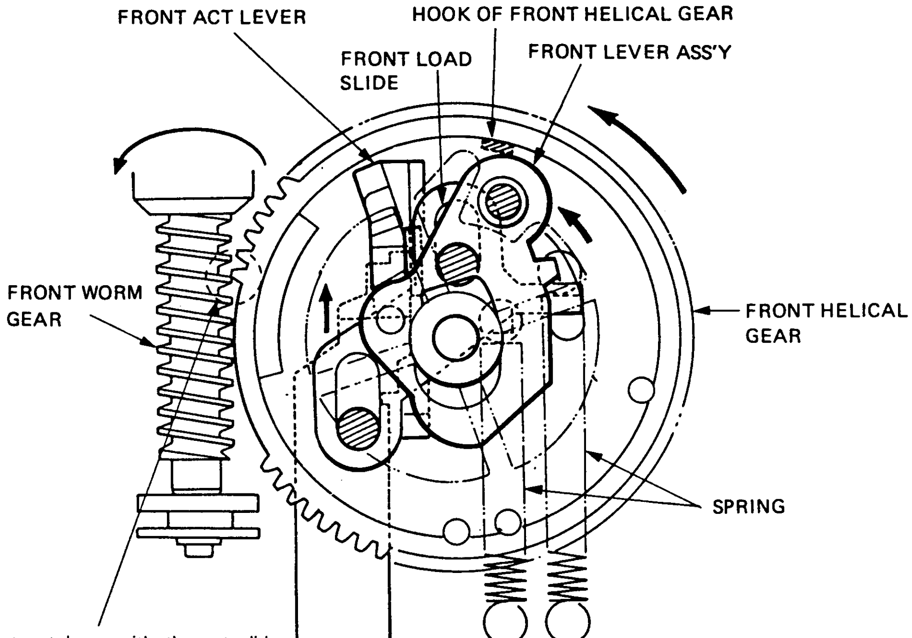

LOADING MOTOR
FRONT HELICAL GEAR
FRONT WORM GEAR
FRONT LEVER ASS'Y
FRONT LOAD GEAR
WORM GEAR HOLDER
(Do not removed from bracket)
FRONT LOAD BRACKET
FRONT ACT LEVER
ACT SLIDE PLATE
FRONT LOAD SLIDE

Fig. 2-16 FRONT LOADING DRIVE SELECTION MECHANISM


FRONT ACT LEVER
HOOK OF FRONT HELICAL GEAR
FRONT LOAD SLIDE
FRONT LEVER ASS'Y
FRONT WORM GEAR
FRONT HELICAL GEAR
SPRING
ACT SLIDE PLATE

By pressing the front act lever with the act slide plate, the front worm gear is engaged with the front helical gear, and starts the operarion to eject the cassette.

Fig. 2-17 CASSETTE EJECTION START OPERATION (See through top view)

## 2-5. CASSETTE HOLDER MECHANISM

### 2-5-1. Components

The exploded view of the cassette holder mechanism is shown in Fig. 2-18. This mechanism consists of a cassette tray for feeding the cassette tape to the specified position of the mechanism chassis, a side plate provided with L type holes for supporting and guiding it, the top plate for regulating the width of left and right, and a group of gears for driving the cassette tray.

The entire mechanism is of independent construction apart from the mechanism body. The holder is fixed on the mechanism chassis by inserting the pawls at two points and tightening the setscrews at two points, or at a total of four points.

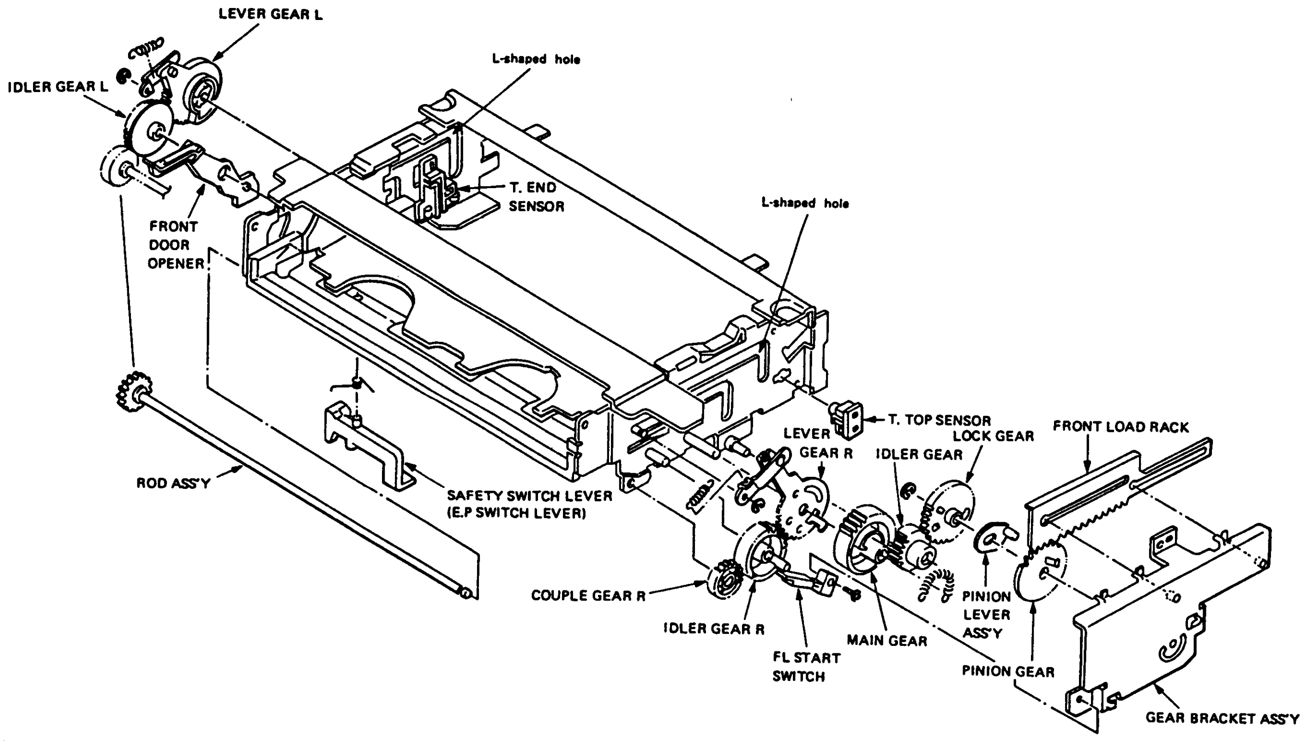

LEVER GEAR L
IDLER GEAR L
L-shaped hole
T. END SENSOR
L-shaped hole
FRONT DOOR OPENER
T. TOP SENSOR
LEVER GEAR R
LOCK GEAR
IDLER GEAR
FRONT LOAD RACK
ROD ASS'Y
SAFETY SWITCH LEVER (E.P SWITCH LEVER)
COUPLE GEAR R
IDLER GEAR R
FL START SWITCH
MAIN GEAR
PINION LEVER ASS'Y
PINION GEAR
GEAR BRACKET ASS'Y

Fig. 2-18 EXPLODED VIEW OF THE CASSETTE HOLDER MECHANISM

### 2-5-2. Description of Cassette Holder

The cassette holder is of motor-less design, as the lowering of mechanism height and driving source are done by the loading motor of the mechanism body.

As a substitute for the worm gear system hitherto used in the major drive section for the drive selection mechanism mentioned in section 2-4., the RACK LOADING system is adopted in this cassette holder mechanism. By this mechanism the motor-less design can be realized. An exploded view of the mechanism is shown in Fig. 2-19. A description of the operation is made below along with Fig. 2-19. To press-fit the cassette tape after sending it onto the mechanism chassis, the PINION GEAR section is triple construction. The FRONT LOAD RACK side and the IDLER GEAR side are independently engaged. The PINION GEAR and the LOCK GEAR are connected from the PINION LEVER PIN riveted to the PINION LEVER. Even after feeding the cassette tape to the specified position of the mechanism chassis, the FRONT LOAD RACK slides, giving the rotation to the PINION GEAR which is engaged with the FRONT LOAD RACK. At that time, a pin is dropped into the groove section provided on the GEAR BRACKET ASS'Y.

The other LOCK GEAR is fixed by this PINION LEVER PIN, and the cassette tape is press-fitted onto the mechanism chassis by linked IDLER GEAR. The before-mentioned FRONT LOAD RACK and the PINION GEAR are set free after dropping the PINION LEVER PIN into the groove section. So, the drive force of the loading motor is sent to the mechanism body.

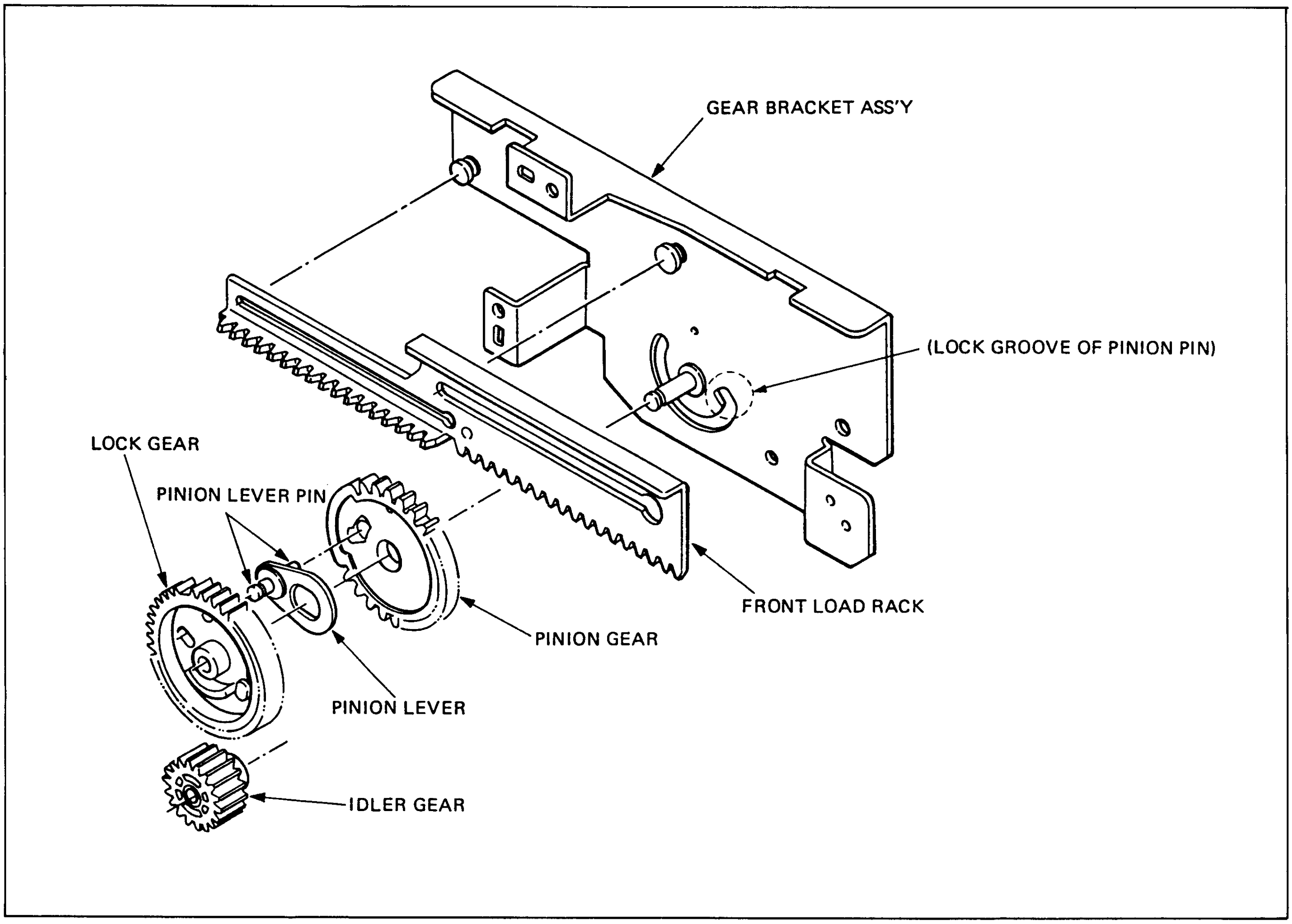


Fig. 2-19 RACK LOADING MECHANISM OF CASSETTE HOLDER

# 3. MECHANISM CONTROL

## 3-1. MODE ARRANGEMENT

This mechanism is arranged in such a mode layout as shown in Table. 3-1 and as described in section 2-1. The mode sensing switch described below is used for control of these modes.

## 3-2. MODE DETECTION SWITCH

For mode detecting two leaf switches (FL START SWITCH and FL END SWITCH), and one rotary switch (MECHANISM MODE SWITCH) are used in combination.

| Mechanism Mode | Mechanism Mode Switch 3 | 2 | 1 | HEX DATA | Function | Main Mode Shifting Conditions | VTR Operation Mode |
|---|---|---|---|---|---|---|---|
| EJECT | – | – | – | | Eject position | | EJECT |
| | | | | | Front loading/Unloading | | |
| SHORT REW | – | – | – | | Take up operation in the tape end position | | Detected by FL END switch |
| | | | | | | | |
| INITIAL | 1 | 1 | 1 | ⑦ | Power off position | | Power off when tape is loaded completely |
| | | | | | Tape unloading position<br>Tape loading<br>Tape loading ending position | | |
| BRAKE | 0 | 0 | 1 | ① | Main brake applying position | | |
| | | | | | | | |
| STOP / FF/REW | 0 | 1 | 0 | ② | STOP waiting and FF/REW (the head motor rotation) | | STOP, FF/REW |
| | | | | | | | |
| STILL | 0 | 1 | 1 | ③ | The positions of STILL, SLOW or F-ADV. | | STILL, SLOW, F-ADV |
| | | | | | | | |
| PLAY | 1 | 0 | 0 | ④ | From FWD direction Normal running mode | | PLAY, REC, F-SEARCH |
| | | | | | | | |
| IDLER | 1 | 0 | 1 | ⑤ | Forward/reverse changeover position | | PAUSE |
| | | | | | | | |
| REV | 1 | 1 | 0 | ⑥ | From REV direction Normal running mode | | R-SERACH |

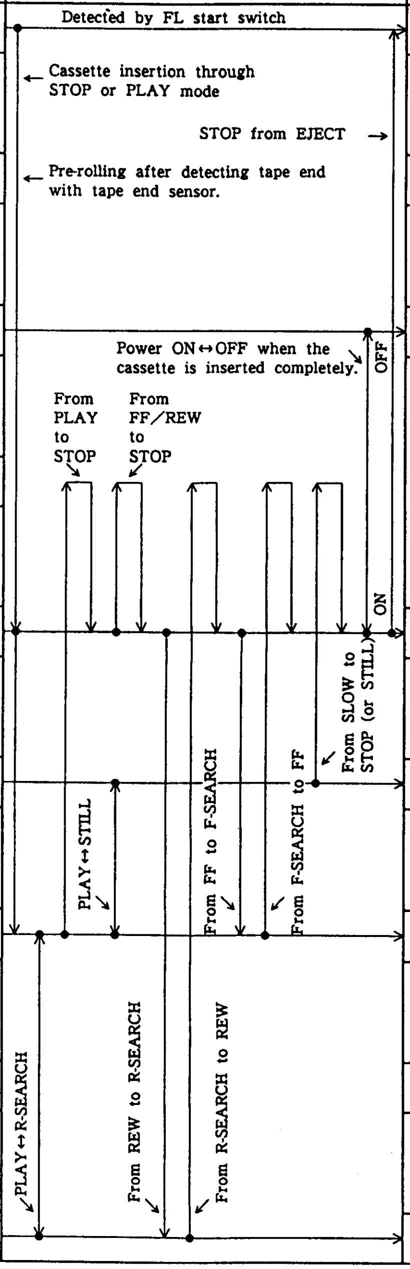

Detected by FL start switch
Cassette insertion through STOP or PLAY mode
STOP from EJECT
Pre-rolling after detecting tape end with tape end sensor.
Power ON↔OFF when the cassette is inserted completely.
OFF
ON
From PLAY to STOP
From FF/REW to STOP
From SLOW to STOP (or STILL)
PLAY↔STILL
From FF to F-SEARCH
From F-SEARCH to FF
PLAY↔R-SEARCH
From REW to R-SEARCH
From R-SEARCH to REW

Table 3-1

(1) Switch component

The mode switch consists of FL START SWITCH for detecting the cassette ejection and insertion, FL END SWITCH for detecting the cassette complete insertion position, that is short rewind position, and MECHANISM MODE SWITCH for detecting the each mode position of the mechanism. As can be understood from Fig. 3-1, the MECHANISM MODE SWITCH rotates in excess of 360 degrees. Therefore, the sensing of a signal from the MECHANISM MODE SWITCH is done by the leaf switch 2.

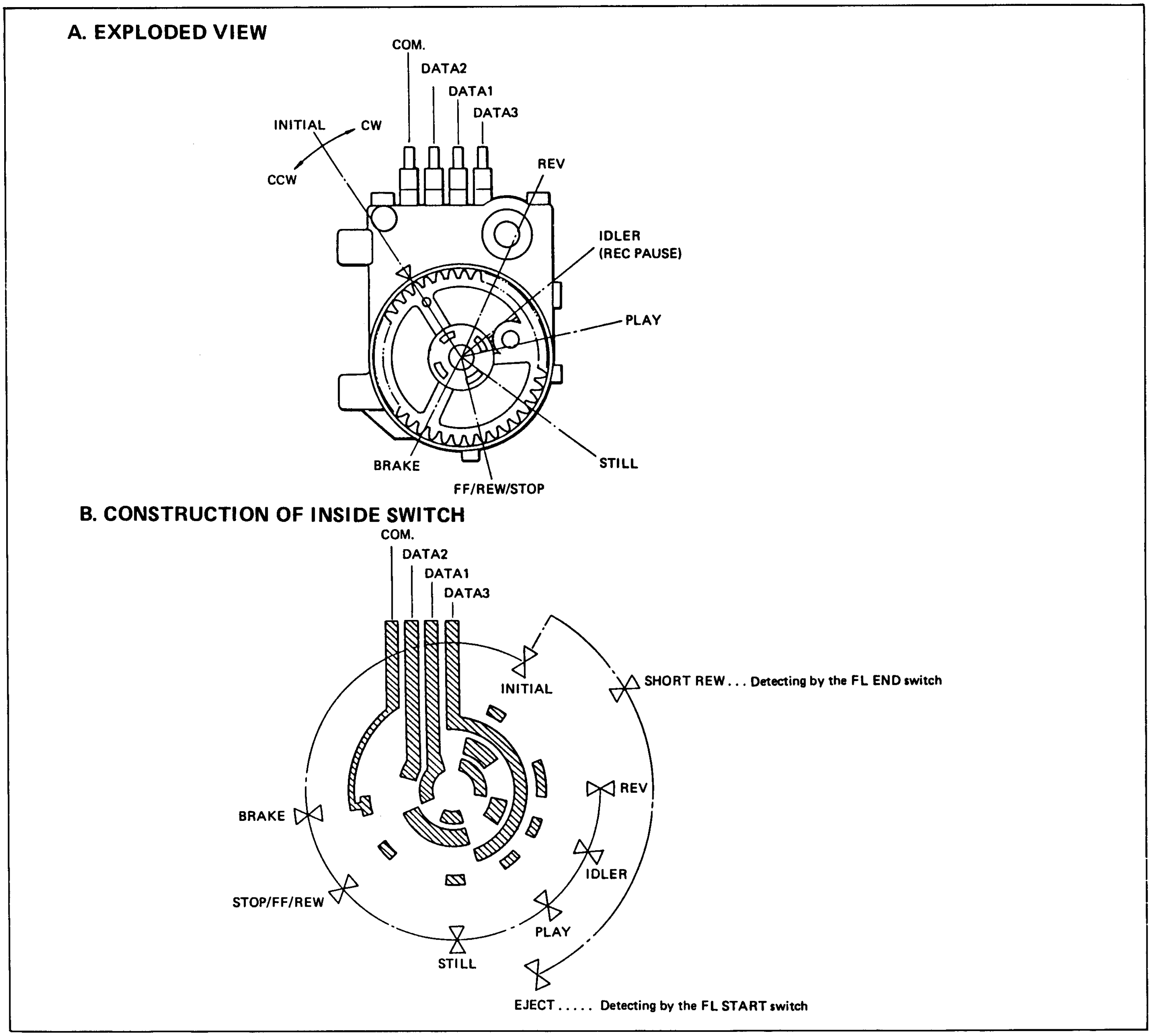
(2) Mechanism mode switch

The mechanism mode switch consists of four terminals, namely, COM, DATA1, DATA2, and DATA3. These are processed as 3-bit signals for discrimination of seven modes.

## 3-3. CONSIDERATION TO FULL LOADING

① In the normal stop condition, the head drum is rotated to facilitate the start-up of the image at the time of playback, but it is conceivable that this is left undisturbed for an extended period of time. This may result in wear of the video head. For this reason, when five minutes elapse from the stop condition, the head drum stops rotating.

② To prevent the tape from being caught in the head drum due to dew forming, etc., the tape is housed in the unloaded cassette when turning the power off.



A. EXPLODED VIEW

COM.
DATA2
DATA1
DATA3
INITIAL
CW
CCW
REV
IDLER (REC PAUSE)
PLAY
STILL
BRAKE
FF/REW/STOP

B. CONSTRUCTION OF INSIDE SWITCH

COM.
DATA2
DATA1
DATA3
INITIAL
SHORT REW... Detecting by the FL END switch
REV
BRAKE
IDLER
STOP/FF/REW
PLAY
STILL
EJECT..... Detecting by the FL START switch

Fig. 3-1 MECHANISM MODE SWITCH (ROTARY SWITCH)

# 4. MECHANISM MAINTENANCE AND CHECKING

## 4-1. PERIODIC CHECKING AND MAINTENANCE ITEMS AND SERVICE JIGS

The following maintenance and periodic checking procedures are recommended to ensure proper operation, and to protect the tape from dirt and damage. Also, these procedures should always be followed after repairing the unit.

### 4-1-1. Periodic Check Items

○ Cleaning ◎ Confirmation △ Lubrication

| Part | Usage Time (hours) | 500 | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tape Guide System | Tape running surfaces | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |
| | ACE head | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |
| | Drum (cylinder) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Head life depends heavily on operating conditions. |
| Drive System | Loading belt | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | |
| | Reel drive belt | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | |
| | Intermediate gear, pulley axles | | △ | | △ | | △ | | △ | | △ | Absolutely avoid oil on tape running surfaces. |
| | Capstan axles | | △ | | △ | | △ | | △ | | △ | |
| | Loading motor | | ◎ | | ◎ | | ◎ | | ◎ | | ◎ | |
| Performance Check | Back tension torque | | ◎ | | ◎ | | ◎ | | ◎ | | ◎ | 42 ± 5gcm |
| | Brake system | | ◎ | | ◎ | | ◎ | | ◎ | | ◎ | |
| | FWD, REW, PLAY torque | | ◎ | | ◎ | | ◎ | | ◎ | | ◎ | FWD, REW : 800gcm and over<br>PLAY (SP) : 80 to 150gcm |

**4-1-2. Cleaning**

① Drum (COMPL CYLINDER) and Video Heads (See Fig. 4-1-1.)

1) Wrap a chamois leather around your finger and moisten it with methyl alcohol.
2) Move the chamois leather to left and right several times on the video head to clean. There is a video head also on the opposite side, so clean it likewise. In Hi-Fi models, clean the audio head also.
3) Clean the tape path surface of the cylinder in the same way.

**Note :** Always turn power off before cleaning. Do never move the chamois leather vertically or apply too much force to the head ; it may be damaged.

② Cleaning of the Tape Guide System (See Fig. 4-1-2.)

1) Set the EJECT mode and clean the tape guide system (tape guides, impedance roller, FTE head, ACE head, pinch rollers, capstan axles, etc.) with a chamois leather moistened with methyl alcohol.

**Note :** Make sure that no oii, grease, etc. adhere to the chamois leather and that heads are not damaged.

③ Cleaning of the Drive System

1) Clean the drive system (loading belt, reel drive belt, pulley, supply reel table, etc.) with a soft cloth moistened with methyl alcohol.

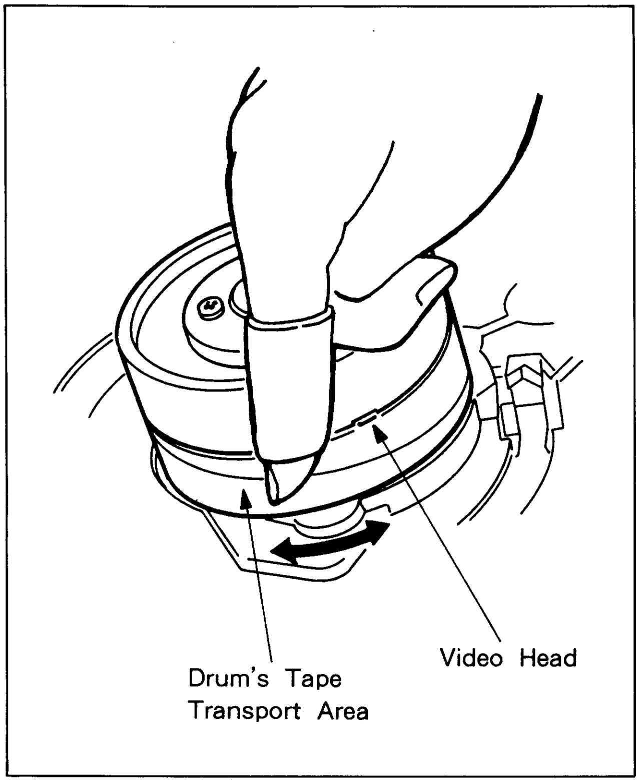

Video Head
Drum's Tape Transport Area

Fig. 4-1-1.

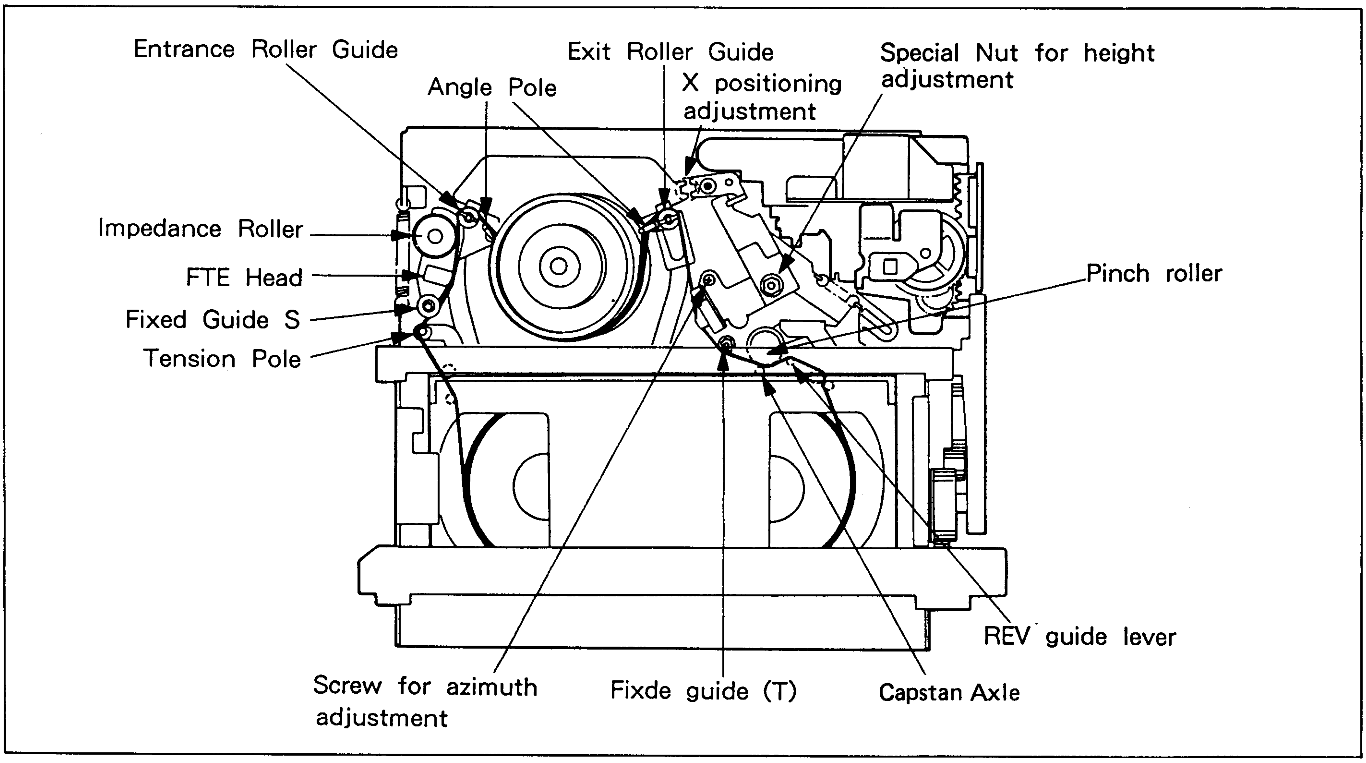
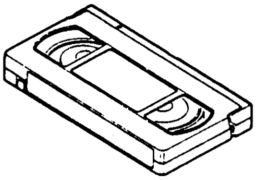

Entrance Roller Guide
Angle Pole
Exit Roller Guide
X positioning adjustment
Special Nut for height adjustment
Impedance Roller
FTE Head
Fixed Guide S
Tension Pole
Pinch roller
REV guide lever
Screw for azimuth adjustment
Fixde guide (T)
Capstan Axle

Fig. 4-1-2. Cleaning

### 4-1-3. Service Jigs

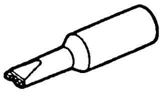
| No. | Jig | Jig No. | Remarks |
|---|---|---|---|
| 1 | Alignment tape | VHJ-0008 | SP color bar, 1kHz (normal) |
| 2 | Alignment tape | VHJ-0009 | SP monoscope, 7kHz (normal) |
| 3 | Alignment tape | VHJ-0052 | LP monoscope, 3kHz (normal) |
| 4 | Eccentric screwdriver | VHJ-0003 | For tape path adjustment |
| 5 | Nut box | VHJ-0048 | For tape path adjustment |
| 6 | Torque gauge | VHJ-0004 | For reel take-up torque measurement |
| 7 | Cassette torquemeter | VHJ-0016 | For back tension torque measurement |
| 8 | Position adjustment gauge | VHJ-0049 | For position adjustment |
| 9 | Torque gauge screwdriver | VHJ-0014 | For screw fastening torque adjustment |
| 10 | 3mm dia. bit for torque screwdriver | VHJ-0045 | Spare bit for the torque gauge screwdriver |
| 11 | Video head removing tool | VHJ-0041 | For upper drum removal |
| 12 | Mode selector | VHJ-0050 | For mechanism mode selection |
| 13 | Cassette stand plate gauge | VHJ-0001 | For reel height adjustment |
| 14 | Fixed guide height gauge | VHJ-0053 | For fixed guide (S) height adjustment |

VHJ-0008, VHJ-0009, VHJ-0052



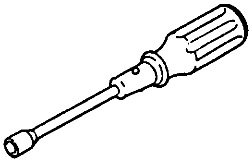
No. 1, 2, 3

VHJ-0003



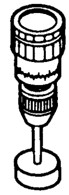
No. 4

VHJ-0048



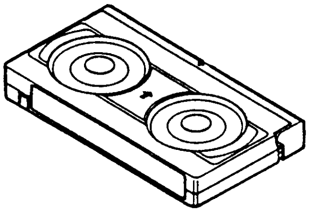
No. 5

VHJ-0004



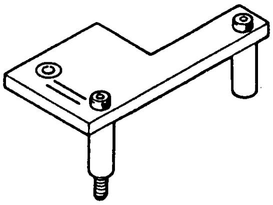
No. 6

VHJ-0016



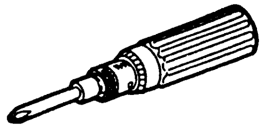
No. 7

VHJ-0049



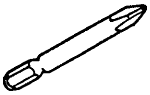
No. 8

VHJ-0014



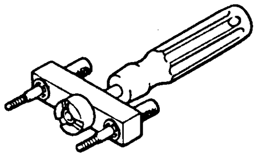
No. 9

VHJ-0045



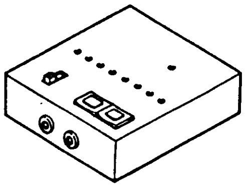
No. 10

VHJ-0041



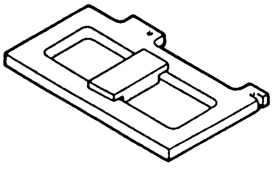
No. 11

VHJ-0050



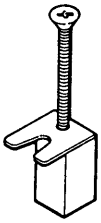
No. 12

VHJ-0001



No. 13

VHJ-0053



No. 14

## 4-2. MODE SELECTOR (VHJ-0050) HANDLING INSTRUCTIONS

The mode selector drives the loading motor of the P88 mechanism with its internal batteries (UM-2 × 4 = 6V), using LEDS to indicate the mode (EJECT, INITIAL, BRAKE, STOP/REW/FWD, STILL, PLAY, IDLER, REV) simultaneously with EJECT⇔REV mode changes.
Instead of the internal batteries, an external DC 6V power supply can also be used.

### 4-2-1. Part Names (See Fig. 4-2-1)

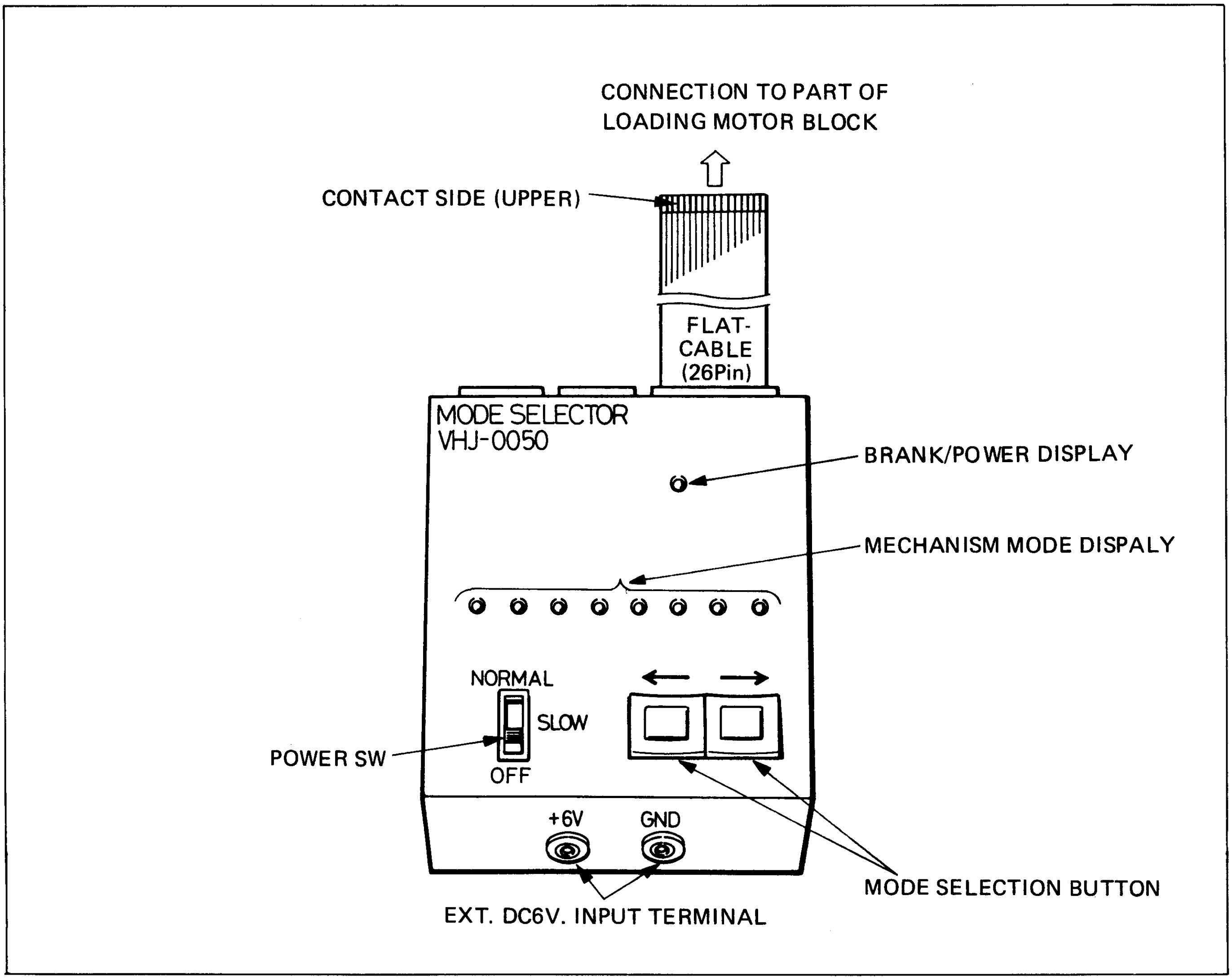

CONNECTION TO PART OF LOADING MOTOR BLOCK
CONTACT SIDE (UPPER)
FLAT-CABLE (26Pin)
MODE SELECTOR VHJ-0050
BRANK/POWER DISPLAY
MECHANISM MODE DISPALY
NORMAL
SLOW
OFF
POWER SW
←
→
+6V
GND
MODE SELECTION BUTTON
EXT. DC6V. INPUT TERMINAL

Fig. 4-2-1

### 4-2-2. Connection (See Fig. 4-2-2)

1) Remove the flexible flat cable connected to the socket (CN812) on the COMPL MC-2 board.
2) Connect the flexible flat cable from the mode selector to the socket (CN812) on the COMPL MC-2 board mentioned in 1).

**Note :** When connecting, be sure to place the contact surface of the flexible flat cable in the proper direction.

### 4-2-3. Handling

1) Keep the right side (⇨) of the mode selector key pressed, and the mode will change in the following sequence : EJECT⇨INITIAL⇨BRAKE⇨STOP/REW/FWD⇨STILL⇨PLAY⇨IDLER⇨REV.
2) When changing the mode in the REV···⇨EJECT direction, press the Left side (⇦) of the mode selector key until the desired mode is indicated.
3) At intermediate positions between modes, the "BLANK" LED lights up (When the mode selector is not connected to the mechanism, the "BLANK" LED indicates that power is on).
4) The SLOW position of the POWER switch allows for a slower operation than the NORMAL position.

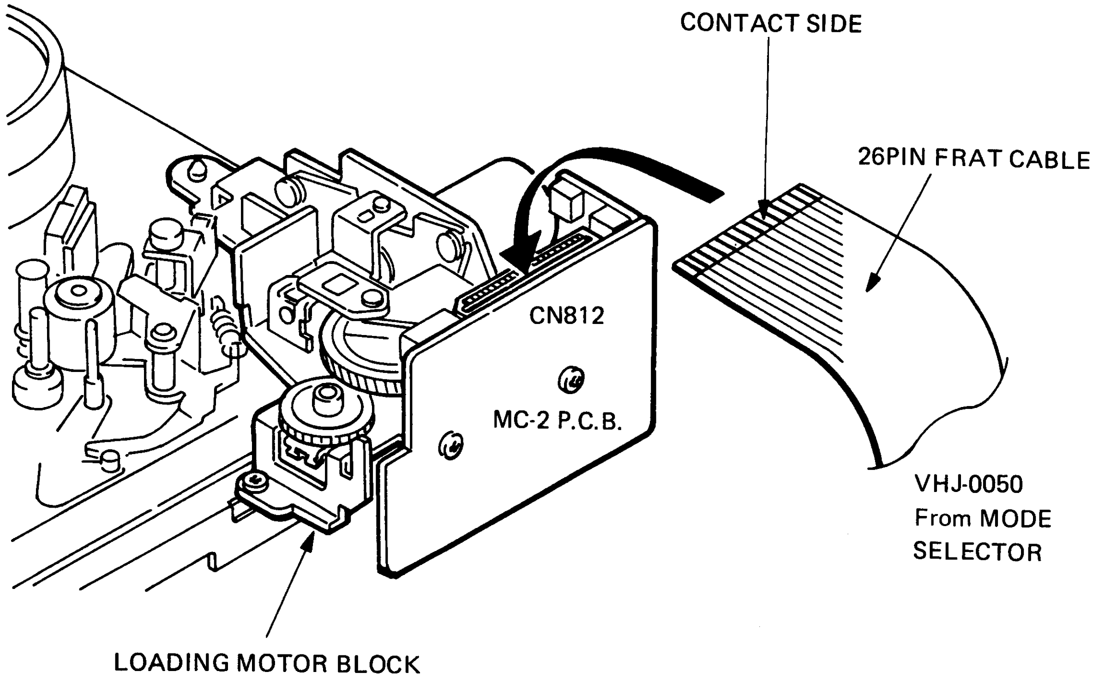


Fig. 4-2-2

**Note 1 :** The mode selector drives the loading motor only, not affecting the head drum motor and the capstan motor. When using the mode selector with a cassette loaded, turn the capstan motor manually to remove tape slackness, preventing tape entanglement.

**Note 2 :** If the Left side (⇦) of the mode selector (VHJ-0050) key is kept pressed with the COMPL cassette mechanism removed, it might get past the EJECT position, causing the front helical gear and the front worm gear to get disengaged.

In this condition, since the front helical gear will not turn even if the right side (⇨) of the mode selector key is pressed, rotate (push) the front helical gear clockwise by hand and engage it with the front worm gear. In this condition, as there is a misalignment between the mechanism main body operation mode (indicated by the mode selector indicator lamps) and the front loading mechanism operation mode, keep the right side (⇨) of the mode selector key pressed until the front helical gear and the front loading gear of the front loading mechanism get back to the initial condition (Refer to A and B in Fig. 5-3-5 of section 5-3-2. Loading Motor).

When the front loading mechanism returns to the initial condition, operation mode of the whole mechanism gets back to normal, matching the mode shown by the mode selector indicator lamps (mode is not properly indicated, however, during eject).

Sometimes, engagement of the front helical gear with the front worm gear is delayed, operation mode of the mechanism main body gets too much ahead and the front loading mechanism mode cannot be switched to the initial condition. In that case, press the Left side (⇦) of the mode selector key, setting the mechanism main body operation mode back to EJECT (rotation of the mode cam and the MAIN CAM stops).

**Note 3 :** The mode selector indicator lamps show the mechanism operation mode, but the EJECT lamp may sometimes fail to indicate the actual mechanism operation mode.

When setting the mechanism to the EJECT or INITIAL mode for dismounting or reassembling, fine adjustment of the each gear and cam, etc., marking positions is required after the mode selector indicator lamp has lighted up. Perform this with the mode selector switch in the SLOW position.

# 5. MECHANISM DISMANTLING AND REASSEMBLING

## 5-1. MECHANISM MAIN UNIT (See Fig. 5-1-1.)

**1. Removal**

1) Remove the connectors of the COMPL MC-2, the COMPL MC-3 and the COMPL HEAD BRACKET.
2) Remove the flexible P.C.B. ① connecting the COMPL CYLINDER to the COMPL VP-1 ③ (See Fig. A).
3) Remove the two screws ②, then remove the COMPL VP-1 ③.
4) Remove the screw ④, then remove the PRE-AMP. BRACKET ⑤.
5) Remove the two screws ⑥.
6) Remove the three screws ⑦ and two screws ⑩, then lift up the mechanism main unit and remove it.
   Since the TRAY ⑧ obstructs removal of the two front screws ⑩, move the TRAY LOCK LEVER ⑨ in the direction of the arrow to unlock, then slide the TRAY ⑧ before removing the screws.

**Note :** Shape of the COMPL VP-1 ③ and the PRE-AMP. BRACKET ⑤ differ depending on the model.

**2. Remounting**

1) Mount the mechanism main unit onto the chassis with the three screws ⑦ and two screws ⑩.
2) Tighten the two screws ⑥.
3) Mount the PRE-AMP. BRACKET ⑤ with the two screws ④.
4) Mount the COMPL VP-1 ③ and the ground lug with the two screws ② (some models are not provided with a ground lug).
5) Insert the flexible P.C.B. ① into the connector of the COMPL VP-1.
6) Connect the connectors of the COMPL MC-2, COMPL MC-3 and COMPL HEAD BRACKET.

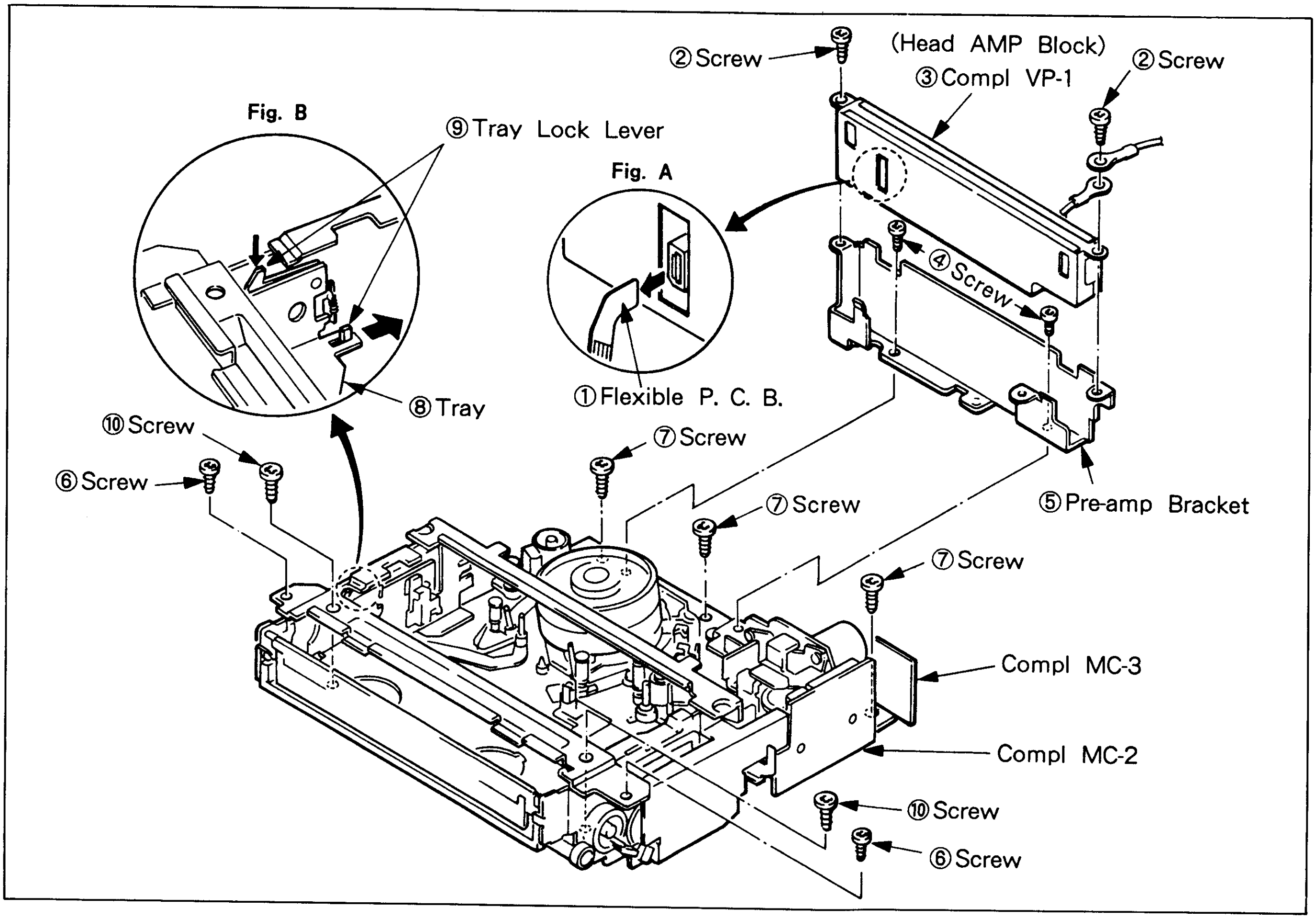

② Screw
(Head AMP Block)
③ Compl VP-1
② Screw
Fig. B
⑨ Tray Lock Lever
Fig. A
④ Screw
① Flexible P. C. B.
⑧ Tray
⑩ Screw
⑥ Screw
⑦ Screw
⑦ Screw
⑤ Pre-amp Bracket
⑦ Screw
Compl MC-3
Compl MC-2
⑩ Screw
⑥ Screw

**Fig. 5-1-1 Mecahnism Main Unit**

## 5-2. CASSETTE HOLDER MECHANISM

### 5-2-1. COMPL Cassette Mechanism (See Fig. 5-2-1.)

**1. Removal**

1) Set the video main unit to the EJECT completed mode.
2) Remove the connectors connected to the COMPL MC-2, the ACE head and the FTE head.
3) Remove the two screws ①.
4) Remove the two screws ②.
5) Lift up the COMPL CASSETTE MECHANISM ④ back a little and remove the two hooks ③ on the front (See Fig. B). When doing so, make sure that the SAFETY SWITCH LEVER is not caught by the mechanism chassis.

**2. Remounting**

1) Set the chassis section mechanism to the EJECT mode with the mode selector (VHJ-0050) (looking from above, match the front loading gear hole ⑤ with the FRONT BRACKET ASS'Y hole ⑥ as shown in Fig. A).
2) Set the COMPL CASSETTE MECHANISM ④ to the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM ④ onto the mechanism chassis, aligning it with the protuberance.
   Match positions of the FRONT LOADING GEAR △ mark ⑦ and the RACK EJECT mark ⑧.
4) Fix to the mechanism chassis with the two screws ②.
5) Fix to the chassis with the screw ①.
6) Connect to the various connectors.

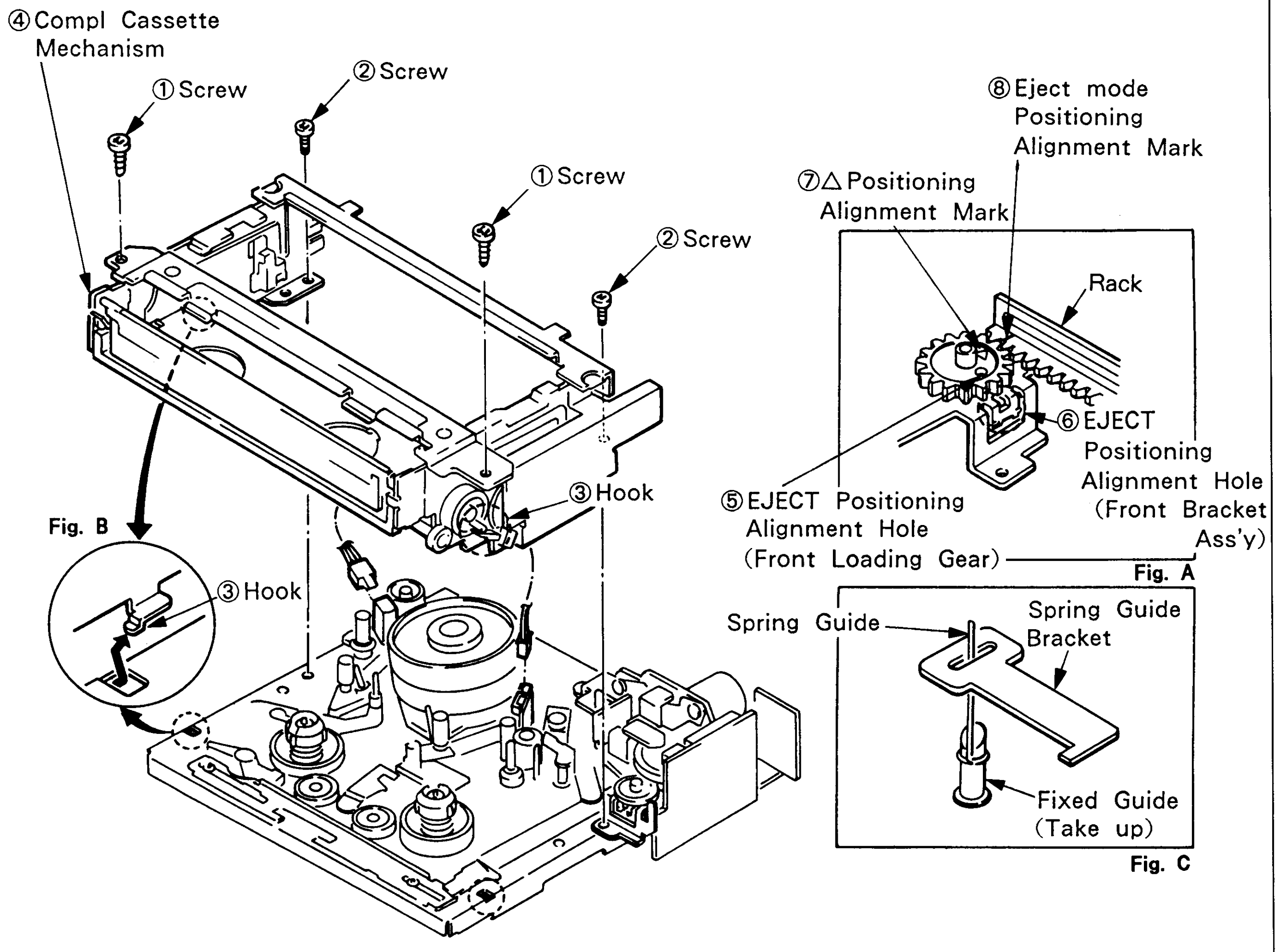

④Compl Cassette Mechanism
①Screw
②Screw
①Screw
②Screw
③Hook
Fig. B
③Hook
⑧Eject mode Positioning Alignment Mark
⑦△ Positioning Alignment Mark
Rack
⑥EJECT Positioning Alignment Hole (Front Bracket Ass'y)
⑤EJECT Positioning Alignment Hole (Front Loading Gear)
Fig. A
Spring Guide
Spring Guide Bracket
Fixed Guide (Take up)
Fig. C

**Fig. 5-2-1 Compl Cassette Mechanism**

## 5-2-2. Gear Bracket Ass'y (See Fig. 5-2-2.)

### 1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the four screws ①, then remove the GEAR BRACKET ASS'Y ②.
3) Remove the E ring ③, then remove the LOCK GEAR ④, the PINION LEVER ASS'Y ⑤, the PINION GEAR ⑥ and the RACK ⑦, in that order.

### 2. Remounting

1) Apply grease to the shaft ⑧ and the two pins ⑨ of the GEAR BRACKET ASS'Y.
2) Apply grease to the pin ⑩ of the PINION LEVER ASS'Y.
3) Apply grease to the toothed part of the RACK ⑦.
4) Fit the RACK ⑦ onto the two pins ⑨. Match position of the hole ⑪ to the GEAR BRACKET hole ⑫.
5) Mount the PINION GEAR ⑥, the PINION LEVER ASS'Y ⑤ and the LOCK GEAR ④ onto the axle ⑧, in that order.
   Do it so that the PINION GEAR and LOCK GEAR HOLE ⑬ is aligned with the GEAR BRACKET hole ⑫.
6) Mount the E ring onto the axle ⑧.
7) Mount the GEAR BRACKET ASS'Y with the four screws ①, aligning it with the protuberance.
   When doing so, make sure that RACK and GEAR do not get misplaced with regard to each other.
   Also confirm that the FL START SWITCH ⑭ is ON.
8) Remount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

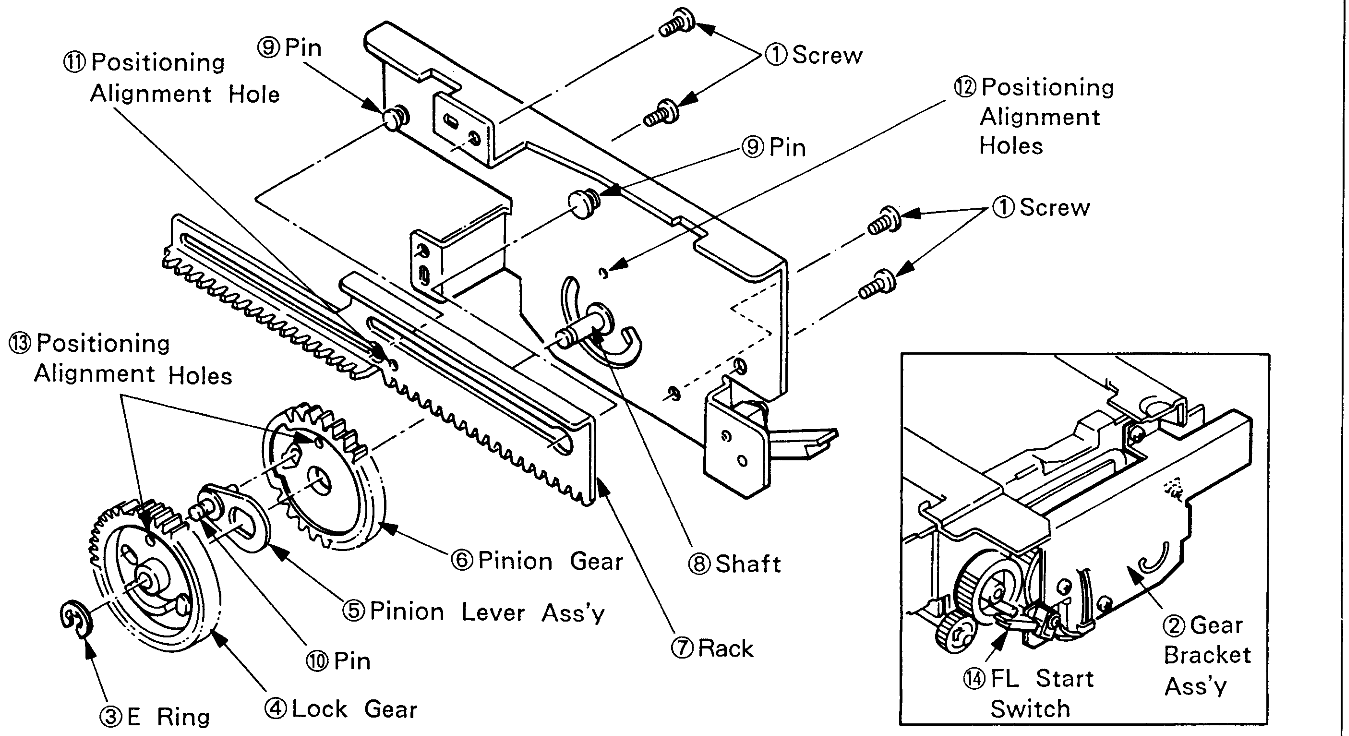

⑪ Positioning Alignment Hole
⑨ Pin
① Screw
⑫ Positioning Alignment Holes
⑨ Pin
① Screw
⑬ Positioning Alignment Holes
⑥ Pinion Gear
⑧ Shaft
⑤ Pinion Lever Ass'y
⑦ Rack
⑩ Pin
③ E Ring
④ Lock Gear
② Gear Bracket Ass'y
⑭ FL Start Switch

Fig. 5-2-2. Gear Bracket Ass'y

### 5-2-3. Cassette Drive Gear (Right) (See Fig. 5-2-3.)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM and the GEAR BRACKET ASS'Y as instructed in 5-2-1. and 5-2-2., respectively.
2) Remove the IDLER GEAR ①.
3) Remove the SPRING COIL ②, then remove the MAIN GEAR ③.
4) Remove the E ring ④, then remove the LEVER GEAR ASS'Y R ⑤.
5) Open the hook ⑥ and remove the COUPLE GEAR R ⑦. Take care not to open the hook ⑥ too much, otherwise it may get deformed or broken. If it does, replace it.
6) Remove the IDLER GEAR R ⑧.

**2. Remounting**

1) Apply grease to gear parts that undergo friction.
2) Mount the IDLER GEAR R ⑧ onto the axle ⑨.
3) Mount the COUPLE GEAR R ⑦ onto the ROD ASS'Y axle ⑩. When doing so, match the couple gear position with the IDLER GEAR R ⑧ as shown in Fig. A.
4) Mount the LEVER GEAR ASS'Y R ⑤ onto the axles ⑪ and ⑫. Match position to the IDLER GEAR R ⑧ as shown in Fig. A.
5) Mount the E ring ④ onto the axle ⑫.
6) Mount the MAIN GEAR ③ onto the axle ⑪. When doing so, match position to the IDLER GEAR R ⑧ as shown in Fig. A.
7) Hook the SPRING COIL ② to the notch ⑬ in the MAIN GEAR R ③ and the LEVER GEAR ASS'Y R.
8) Mount the IDLER GEAR ① onto the axle ⑭. When doing so, match position to the MAIN GEAR as shown in Fig. A.
9) Mount the GEAR BRACKET ASS'Y and the COMPL CASSETTE MECHANISM ASS'Y as instructed in 5-2-2. and 5-2-1., respectively.

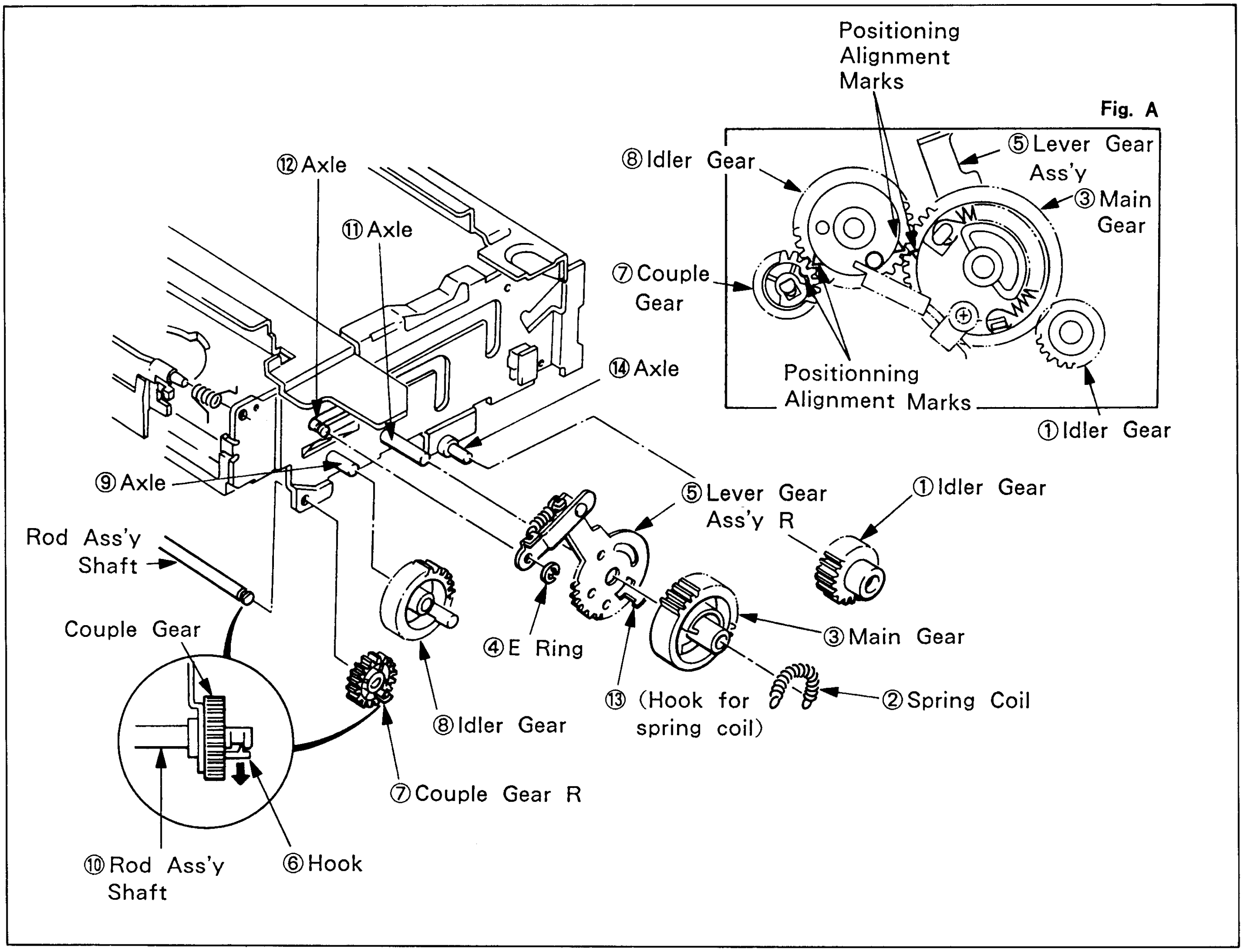

Positioning Alignment Marks
Fig. A
⑧Idler Gear
⑤Lever Gear Ass'y
③Main Gear
⑦Couple Gear
Positionning Alignment Marks
①Idler Gear
⑫Axle
⑪Axle
⑭Axle
⑨Axle
Rod Ass'y Shaft
Couple Gear
⑤Lever Gear Ass'y R
①Idler Gear
④E Ring
③Main Gear
⑬ (Hook for spring coil)
②Spring Coil
⑧Idler Gear
⑦Couple Gear R
⑩Rod Ass'y Shaft
⑥Hook

Fig. 5-2-3. Cassette Drive Gears (Right Side)

### 5-2-4. Cassette Drive Gear (Left) (See Fig. 5-2-4)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the COUPLE GEAR R as instructed in 5-2-3.
3) Remove the ROD ASS'Y ①.
4) Remove the E ring ②.
5) Remove the hook ③, then remove the LEVER GEAR ASS'Y L ④. Take care not to open the hook ③ too much, otherwise it may get deformed or broken. If it does, replace it.
6) Remove the SPRING COIL ⑤ from the LEVER GEAR ASS'Y ④.
7) Remove the IDLER GEAR L ⑥ and the DOOR OPEN LEVER ⑦.

**2. Remounting**

1) Apply grease to the axles ⑧, ⑨ and ⑩.
2) Apply grease to the IDLER GEAR L ⑥.
3) Mount the DOOR OPEN LEVER ⑦ onto the axle ⑧. Do it so that the end of the DOOR OPEN LEVER ⑦ leans against the front side of the CASSETTE DOOR ⑪ as shown in Fig. A.
4) Mount the IDLER GEAR L ⑥ onto the axle ⑧.
5) Pass the ROD ASS'Y ① through the hole ⑫. Match position of the COUPLE GEAR L ⑬ and the IDLER GEAR L ⑥ as shown in Fig B.
6) Mount the COUPLE GEAR R as instructed in 5-2-3.
7) Hook the SPRING COIL ⑤ to the LEVER GEAR ASS'Y L ④.
8) Mount the LEVER GEAR ASS'Y L ④ onto the axle ⑨ and the shaft ⑩. Match position to the IDLER GEAR L ⑥ as shown in Fig. B.
9) Mount the COMPL CASSETTE MECHANISM onto the chassis as instructed in 5-2-1.

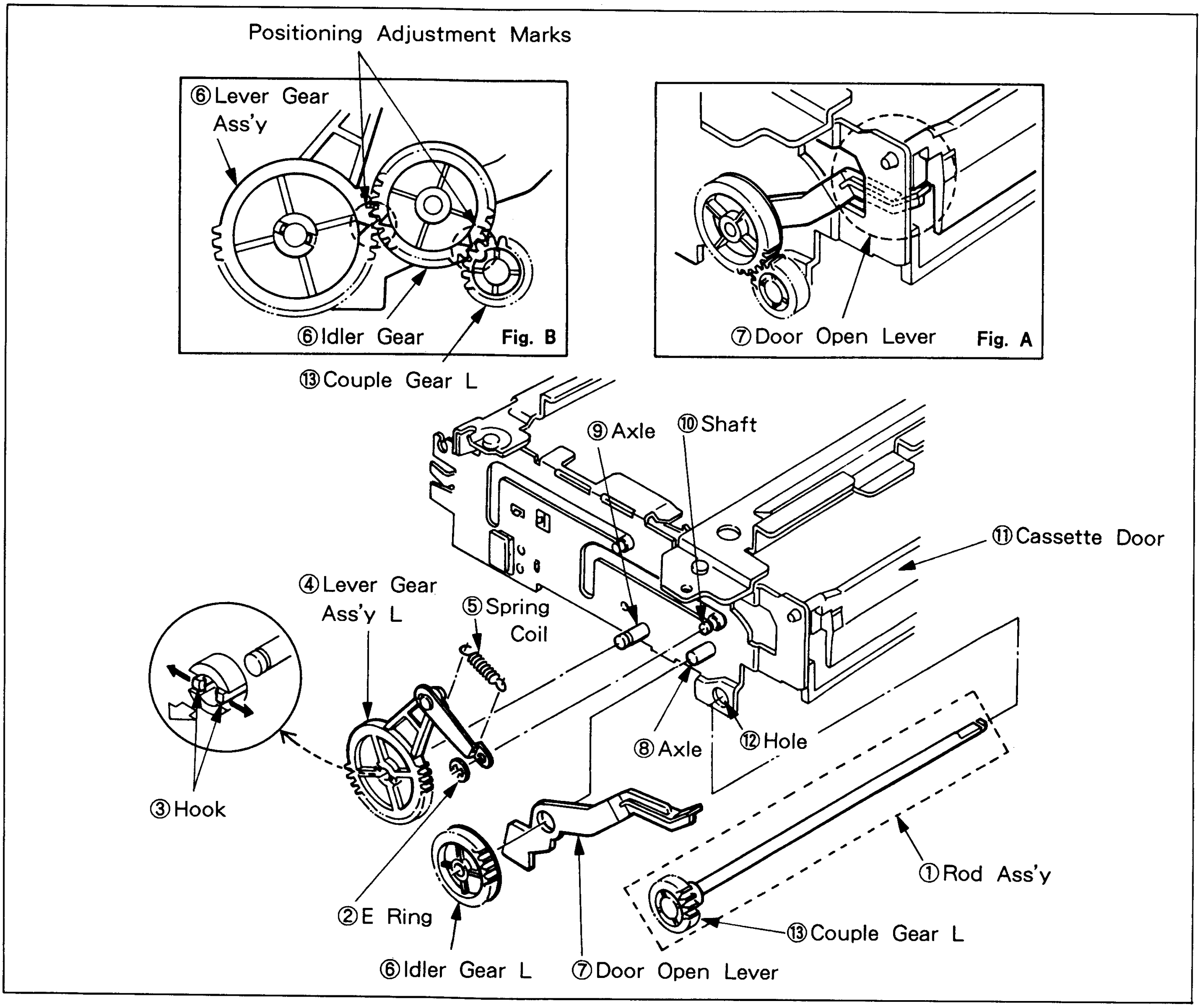

Positioning Adjustment Marks
⑥Lever Gear Ass'y
⑥Idler Gear
Fig. B
⑬Couple Gear L
⑦Door Open Lever
Fig. A
⑨Axle
⑩Shaft
⑪Cassette Door
④Lever Gear Ass'y L
⑤Spring Coil
③Hook
⑧Axle
⑫Hole
①Rod Ass'y
②E Ring
⑬Couple Gear L
⑥Idler Gear L
⑦Door Open Lever

Fig. 5-2-4. Cassette Drive Gears (Left Side)

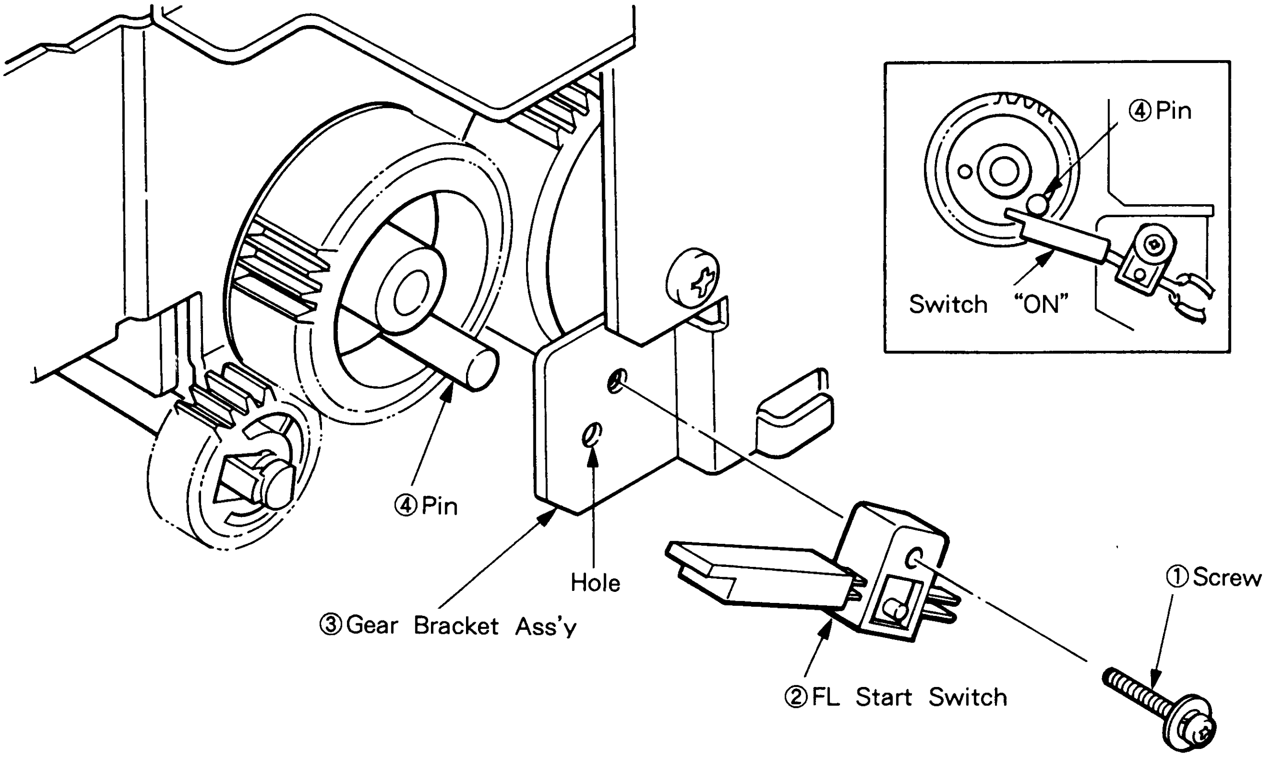
## 5-2-5. FL Start Switch (See Fig. 5-2-5.)

### 1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the screw ①.
3) Remove the lead wire of the FL START SWITCH ②.

### 2. Remounting

1) Solder the lead wire to the FL START SWITCH ② terminal.
2) Align the FL START SWITCH ② protuberance to the hole, then mount it onto the GEAR BRACKET ASS'Y ③ with the screw ①. Do it so that the FL START SWITCH ② is turned ON by holding the pin ④ of IDLER GEAR in the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.


④Pin
Switch "ON"
④Pin
Hole
③Gear Bracket Ass'y
②FL Start Switch
①Screw

5-2-5. FL Start Switch

### 5-2-6. T-Top Sensor, T-End Sensor (See Fig. 5-2-6.)

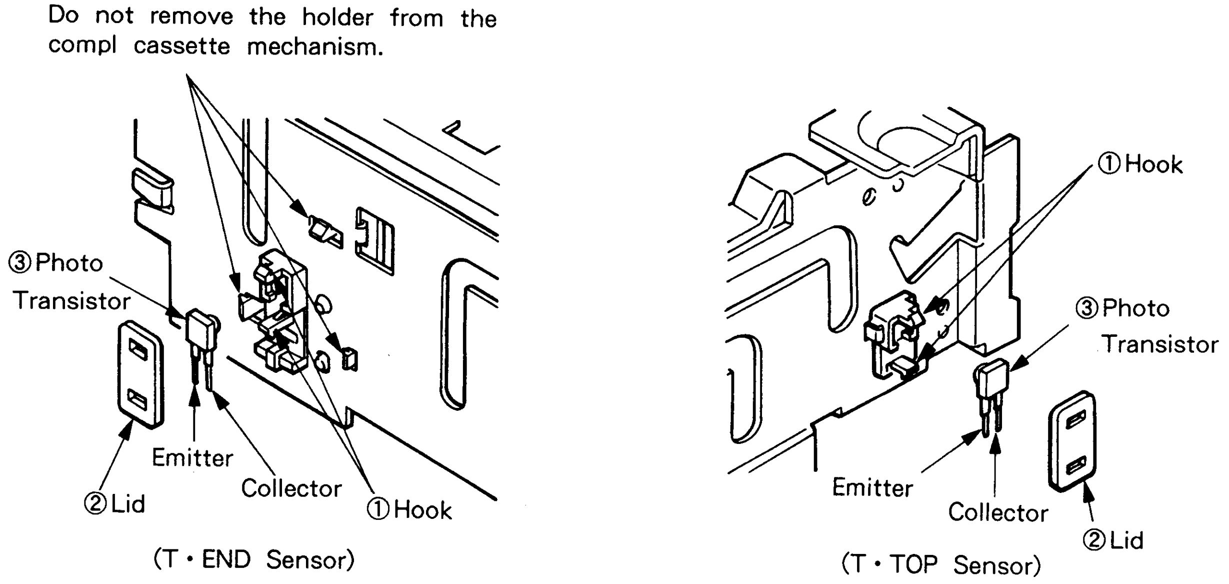
**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) When removing the T-TOP SENSOR, remove the GEAR BRACKET ASS'Y as instructed in 5-2-2.
3) Unhook the hook ① as instructed in Fig. A, then remove the LID ②. Take care not to push the hook ① too much, otherwise it may be deformed or broken.
4) Remove the phototransistors ③, then remove the lead wire.

**Note :** Mounting position of the transistor holder on the T-END SENSOR side is precisely adjusted at the factory, so do never remove it from the COMPL CASSETTE MECHANISM.

**2. Remounting**

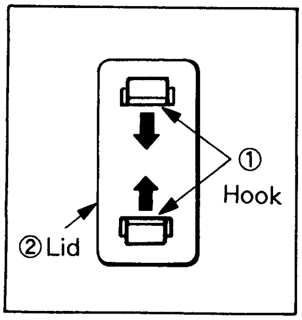
1) Solder the brown lead wire to the emitter side, and the red lead wire to the collector side of the T-TOP SENSOR phototransistor ③.
   Solder the orange lead wire to the emitter side, and the yellow lead wire to the collector side of the T-END SENSOR phototransistor.
2) Mount the phototransistors ③ onto their respective holders.
3) Mount the LID ② and fix it with the hook ①.
4) Mount the GEAR BRACKET ASS'Y as instructed in 5-2-2.
5) Mount the COMPL CASSETTE MECHANISM as insturcted in 5-2-1.


Do not remove the holder from the compl cassette mechanism.
③Photo Transistor
Emitter
Collector
②Lid
①Hook
①Hook
③Photo Transistor
Emitter
Collector
②Lid

(T • END Sensor)

(T • TOP Sensor)

Fig. A



5-2-6. T TOP Sensor & T END Sensor

## 5-3. COMPL MOTOR BRACKET (LOADING MOTOR BLOCK)

### 5-3-1. COMPL Motor Bracket

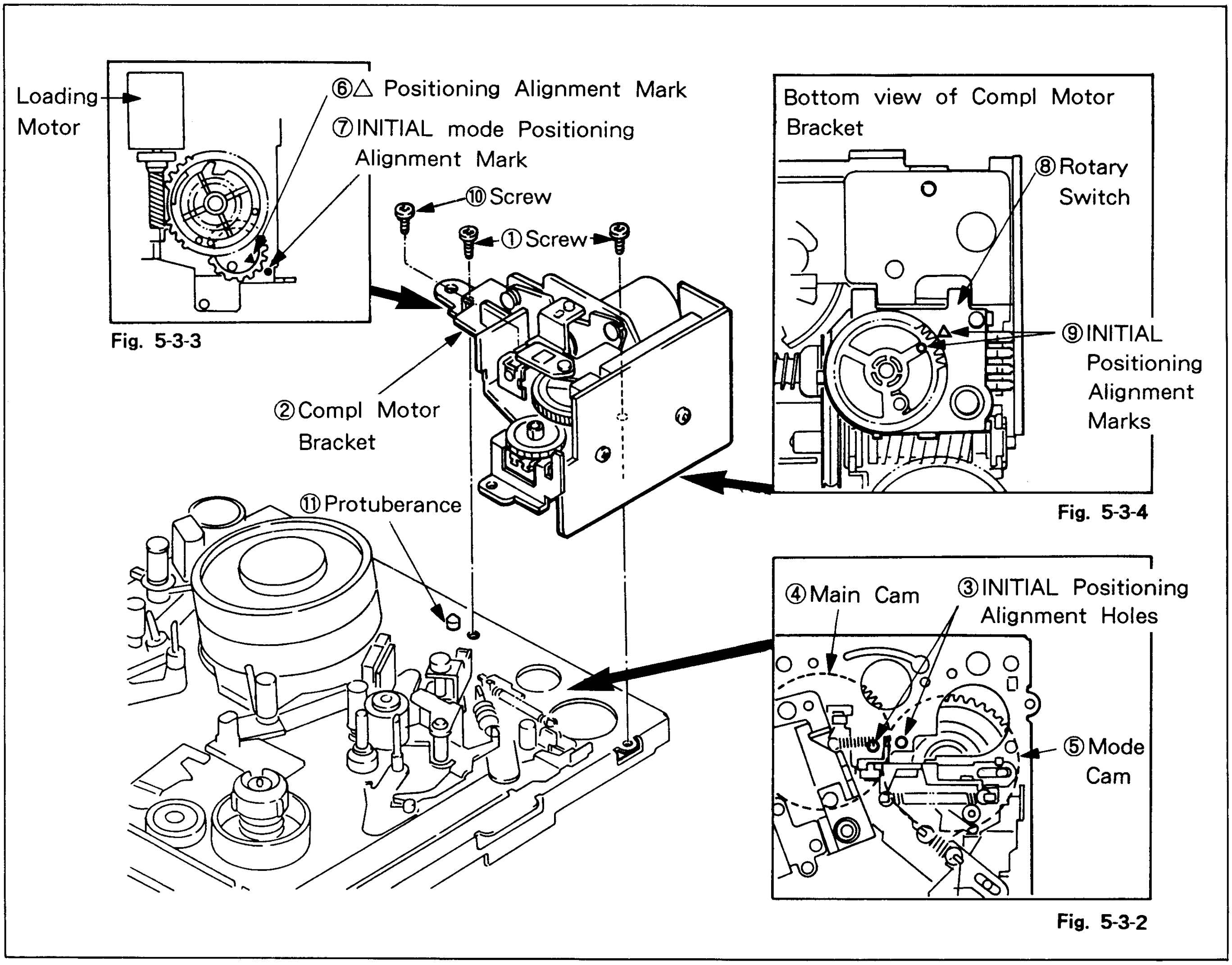
**1. Removal**

1) Remove the COMPL VP-1 and the PRE-AMP. BRACKET as instructed in 5-1.
2) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
3) Remove the two screws ① and the other one ⑩, then remove the COMPL MOTOR BRACKET ② (see Fig. 5-3-1.).

**2. Remounting**

1) Set the mechanism chassis to the INITIAL mode. In this mode, look at the mechanism chassis positioning holes ③ just from above and align the MAIN CAM ④ and MODE CAM ⑤ positioning holes as shown in Fig. 5-3-2.
2) Set the COMPL MOTOR BRACKET to the INITIAL mode with the mode selector (VHJ-0050). In this position, the FRONT LOADING GEAR △ mark ⑥ is aligned with the FRONT BRACKET ASS'Y initial position mark ⑦ (see Fig. 5-3-3.).
3) Align the ROTARY SWITCH (mode detector switch) ⑧ with the INITIAL mode position mark ⑨ (see Fig. 5-3-4.).
4) Align the COMPL MOTOR BRACKET main unit ② with the protuberance ⑪, then mount it with the two screws ① and the other one ⑩.
5) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
6) Mount the COMPL VP-1 and the PRE-AMP. BRACKET as instructed in 5-1.

**Note :** Normal mechanism operation cannot be achieved if initial positioning of the MAIN CAM ④, the MODE CAM ⑤ and the ROTARY SWITCH (mode detector switch) ⑧ are not performed precisely.


Loading Motor
⑥△ Positioning Alignment Mark
⑦INITIAL mode Positioning Alignment Mark
Fig. 5-3-3
⑩Screw
①Screw
②Compl Motor Bracket
⑪Protuberance
Bottom view of Compl Motor Bracket
⑧Rotary Switch
⑨INITIAL Positioning Alignment Marks
Fig. 5-3-4
④Main Cam
③INITIAL Positioning Alignment Holes
⑤Mode Cam
Fig. 5-3-2

5-3-1. Compl Motor Bracket

## 5-3-2. Loading Motor (See Fig. 5-3-5.)

### 1. Removal

1) Remove the COMPL VP-1 and the PRE-AMP. BRACKET as instructed in 5-1.
2) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
3) Remove the COMPL MOTOR BRACKET as instructed in 5-3-1.
4) Remove the two screws ①, then remove the COMPL MC-2 ②.
5) Remove the COMPL MC-3 ③ DEW SENSOR connector.
6) Remove the special washer ④.
7) Remove the two screws ⑤ then remove the HOLDER BRACKET ⑥.
8) Remove the FRONT WORM ASS'Y ⑦, the washer ⑧ and the DAMPER ⑨.
9) Remove the washer ⑩ and the FRONT HELICAL GEAR ⑪.
10) Remove the lead wires from the LOADING MOTOR ⑫ terminals.
11) Remove the LOADING BELT ⑬.
12) Remove the two screws ⑭, then remove the STAND BRACKET ⑮.
13) Remove the three screws ⑯, then remove the MOTOR PLATE ⑱ with the MOTOR DAMPER ⑰ attached.
14) Remove the two screws ⑲, then remove the LOADING MOTOR ⑫.

**Note 1 :** When the WORM HOLDER has been removed, always replace it with a new one to prevent noise generation.

**Note 2 :** In some models, the COMPL MOTOR BRACKET is not provided with STAND BRACKET ⑮, MOTOR DAMPER ⑰ and MOTOR PLATE ⑱. Also, in some cases the LOADING MOTOR ⑫ is soldered directly to the COMPL MC-2.

### 2. Remounting

1) Mount the LOADING MOTOR ⑫ to the MOTOR PLATE ⑱ with the two screws ⑲.
2) After mounting the three MOTOR DAMPERS ⑰ onto the MOTOR PLATE ⑱, mount the latter onto the STAND BRACKET ⑮ with the three screws ⑯.
3) Mount the STAND BRACKET ⑮ onto the MOTOR BRACKET ASS'Y ⑳ with the two screws ⑭.
4) Fit the LOADING BELT ⑬ around the pulley.
5) Align the FRONT LOADING GEAR △ mark ㉑ with the FRONT BRACKET ASS'Y initial position mark ㉒ as shown in Fig. A.
6) Apply a thin layer of grease to the axle ㉓ and the whole side surface of the FRONT HELICAL GEAR ⑪.
7) Mount the FRONT HELICAL GEAR ⑪ and the washer ⑩ onto the axle ㉓. Do this so that the FRONT LEVER ASS'Y pin ㉔ gets into the FRONT HELICAL GEAR ⑪ side indent as shown in Fig. B.
8) Mount the DAMPER ⑨ and the FRONT WORM ASS'Y ⑦, in that order, onto the LOADING MOTOR ⑫.
9) Pass the washer ⑧ through the FRONT WORM ASS'Y AXLE ㉕.
10) Mount the HOLDER BRACKET ⑥ with the two screws ⑤, aligning it to the protuberance. the protuberance.
11) Mount the special washer ④ to the FRONT WORM ASS'Y AXLE ㉕.
12) Connect the COMPL MC-3 ③ DEW SENSOR connector.
13) Mount the COMPL MC-2 ② with the two screws ①.
14) Solder the lead wires to the LOADING MOTOR terminals (solder the red lead wire to the (+) terminal and the white lead wire to the (−) terminal).
15) Mount the COMPL MOTOR BRACKET (loading motor block) onto the mechanism chassis as instructed in 5-3-1.
16) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
17) Mount the PRE-AMP. BRACKET and the COMPL VP-1 as instructed in 5-1.

**Note 1 :** Position gears precisely.

**Note 2 :** Always set the ROTARY SWITCH to the INITIAL position before mounting the COMPL MOTOR BRACKET onto the mechanism chassis.

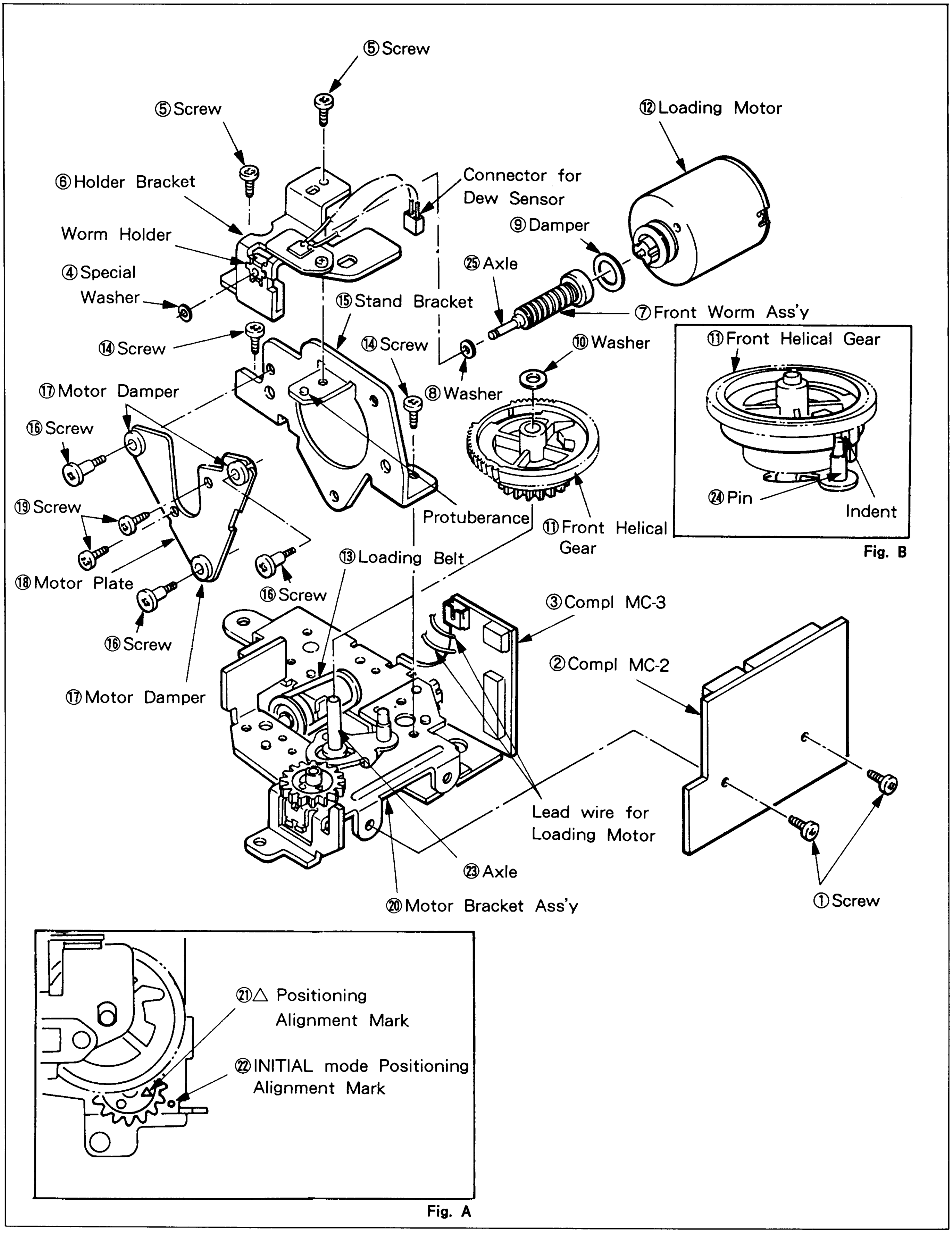

⑤Screw
⑤Screw
⑫Loading Motor
⑥Holder Bracket
Connector for Dew Sensor
Worm Holder
⑨Damper
④Special Washer
㉕Axle
⑮Stand Bracket
⑦Front Worm Ass'y
⑭Screw
⑭Screw
⑩Washer
⑪Front Helical Gear
⑰Motor Damper
⑧Washer
⑯Screw
⑲Screw
Protuberance
㉔Pin
Indent
⑪Front Helical Gear
Fig. B
⑬Loading Belt
⑱Motor Plate
⑯Screw
③Compl MC-3
⑯Screw
②Compl MC-2
⑰Motor Damper
Lead wire for Loading Motor
㉓Axle
⑳Motor Bracket Ass'y
①Screw
㉑△ Positioning Alignment Mark
㉒INITIAL mode Positioning Alignment Mark
Fig. A

**Fig. 5-3-5. Loading Motor**

## 5-4. TAPE LOADING MECHANISM

### 5-4-1. Main Parts of the Tape Loading Mechanism (See Fig. 5-4-1.)

**1. Removal**

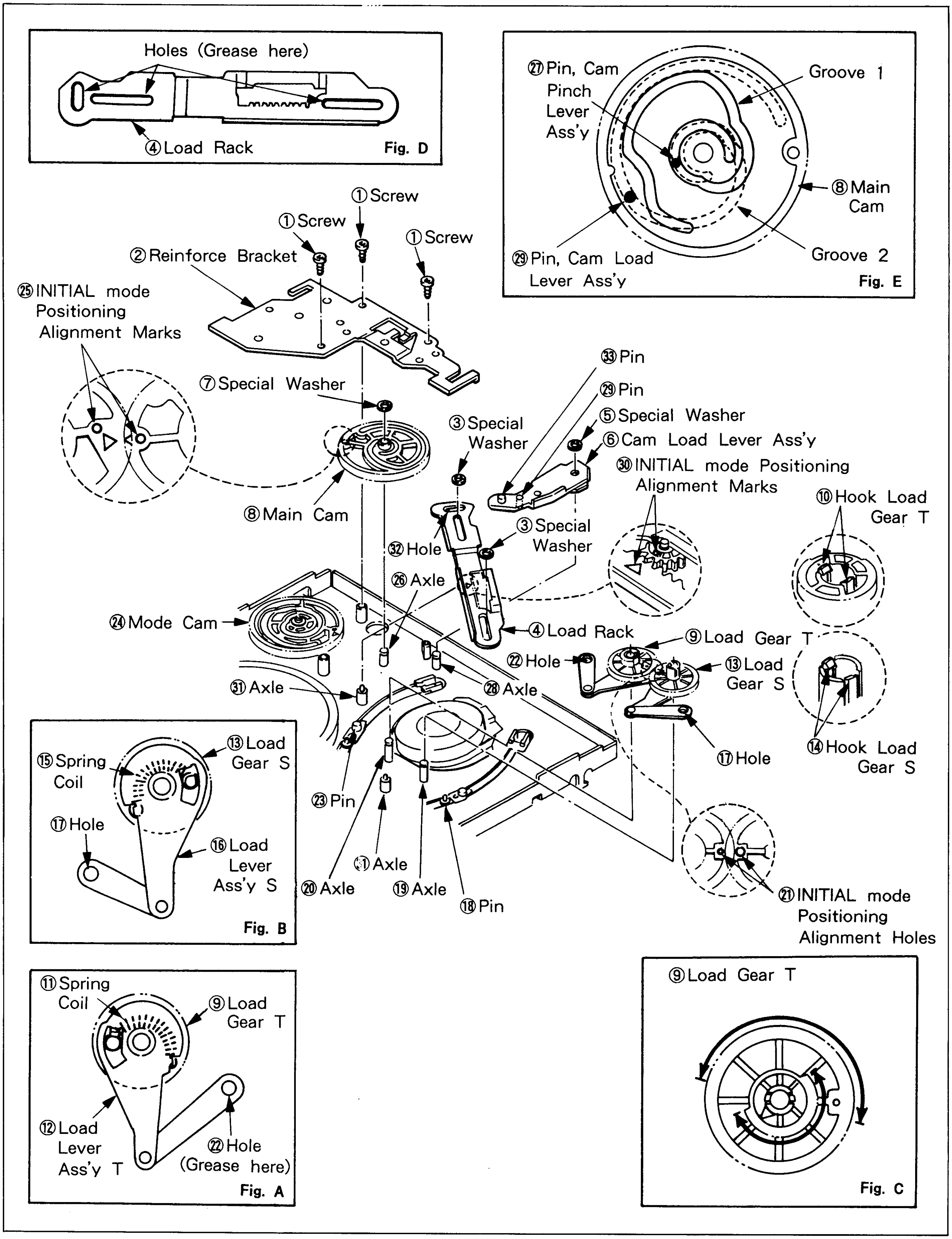
1) Remove connectors from the DRUM MOTOR board (SV-5).
2) Remove the three screws ①, then remove the REINFORCE BRACKET ②.
3) Remove the two special washers ③, then remove the LOAD RACK ④.
4) Remove the special washer ⑤, then remove the CAM LOAD LEVER ASS'Y ⑥.
5) Remove the stop washer ⑦, then remove the MAIN CAM ⑧.
6) Unhook the LOAD GEAR T hook ⑩, then remove the LOAD GEAR T ⑨ as shown in Fig. A, with the SPRING COIL ⑪ and the LOAD LEVER ASS'Y T ⑫ attached to it.
7) Unhook the LOAD GEAR S hook ⑭, then remove the LOAD GEAR S ⑬ as shown in Fig. B, with the SPRING COIL S ⑮ and the LOAD LEVER ASS'Y S ⑯ attached to it.

**Note :** Take care not to open the LOAD GEAR hooks too much, otherwise they may be deformed or broken. If they are, replace them.

**2. Remounting**

1) Apply grease to the inner surface of the LOAD LEVER ASS'Y S ⑯ hole ⑰, as shown in Fig. B.
2) Apply grease to the inner surface of the LOAD LEVER ASS'Y T ⑫ hole ㉒ and to the section of the LOAD GEAR T ⑨ indicated with an arrow in Fig. C.
3) Apply grease to GROOVEs 1 and 2 of the MAIN CAM ⑧, and to the outer side of the teeth.
4) Apply grease to the three oval holes of the LOAD RACK ④ as shown in Fig. D.
5) Apply grease to the outer surface of axles ⑲ ⑳㉖ and ㉘.
6) After assembling as shown in Fig. B, mount the LOAD GEAR S ⑬ onto the axle ⑲. Insert the ROLLER BASE S pin ⑱ into the LOAD LEVER ASS'Y S hole ⑰.
7) After assembling as shown in Fig. A, mount the LOAD GEAR T ⑨ onto the axle ⑳. When doing so, set the LOAD GEAR S ⑬ and the LOAD GEAR T ⑨ to the INITIAL mode position ㉑. Insert the ROLLER BASE T pin ㉓ into the hole ㉒ of the LOAD LEVER ASS'Y T ⑫.
8) Set the MAIN CAM ⑧ to the INITIAL mode position ㉕ with the MODE CAM ㉔, and mount onto the axle ㉖. Confirm that the CAM PINCH LEVER ASS'Y pin ㉗ gets into the MAIN CAM GROOVE 1 as shown in Fig. E.
9) Mount the special washer ⑦ to the axle ㉖.
10) Mount the CAM LOAD LEVER ASS'Y ⑥ onto the axle ㉘. Insert the pin ㉙ into the MAIN CAM GROOVE 2 as shown in Fig. E.
11) Mount the special washer ⑤ onto the axle ㉘.
12) Set the LOAD RACK ④ to the INITIAL mode position ㉚ with the LOAD GEAR T ⑨, and mount onto the two axles ㉛. Insert the CAM LOAD LEVER ASS'Y pin ㉝ into the hole ㉜.
13) Mount the two special washers ③ onto the two axles ㉛.
14) Mount the REINFORCE BRACKET ② with the three screws ①.
15) Insert the connector into the DRUM MOTOR board (SV-5).
16) Confirm that loading and unloading are performed smoothly.

**Note :** Be sure to perform INITIAL mode positioning of cams and gears precisely.


Holes (Grease here)
④Load Rack
Fig. D
㉗Pin, Cam Pinch Lever Ass'y
Groove 1
⑧Main Cam
Groove 2
㉙Pin, Cam Load Lever Ass'y
Fig. E
①Screw
①Screw
①Screw
②Reinforce Bracket
㉕INITIAL mode Positioning Alignment Marks
⑦Special Washer
⑧Main Cam
㉝Pin
㉙Pin
③Special Washer
⑤Special Washer
⑥Cam Load Lever Ass'y
㉚INITIAL mode Positioning Alignment Marks
⑩Hook Load Gear T
㉜Hole
③Special Washer
㉖Axle
㉔Mode Cam
④Load Rack
⑨Load Gear T
㉒Hole
⑬Load Gear S
㉛Axle
㉘Axle
⑰Hole
⑭Hook Load Gear S
⑮Spring Coil
⑬Load Gear S
⑰Hole
⑯Load Lever Ass'y S
Fig. B
㉓Pin
㉛Axle
⑳Axle
⑲Axle
⑱Pin
㉑INITIAL mode Positioning Alignment Holes
⑪Spring Coil
⑨Load Gear T
⑫Load Lever Ass'y T
㉒Hole (Grease here)
Fig. A
⑨Load Gear T
Fig. C

5-4-1. Loading Mechanism Main Parts

### 5-4-2. Mode Cam (See Fig. 5-4-2.)

**1. Removal**

1) Set the INITIAL mode with the mode selector (VHJ-0050).
2) Remove the REINFORCE BRACKET as instructed in 5-4-1.
3) Remove the two stop washers ①, then remove the CAM PLATE SLIDE ASS'Y ②.
4) Remove the MODE CAM ③.

**2. Remounting**

1) Referring to 5-4-1., confirm that the MAIN CAM is in the INITIAL mode position.
2) In case the MAIN CAM is misplaced, use the mode selector (VHJ-0050) to align the MAIN CAM positioning hole with the chassis INITIAL mode position hole (refer to 5-4-1. for the INITIAL mode position). Since the ROTARY SWITCH (mode detector switch) does not rotate, the mode selector indicator lamp will not show the correct mode.
3) Align the ROTARY SWITCH (mode detector switch) ④ with the INITIAL mode position mark ⑤ as shown in Fig. A.
4) Mount the MODE CAM ③ onto the axle ⑥. Do it so that the SLIDE CAM ASS'Y pin ⑪ is placed in the GROOVE 3 as shown in Fig. B.
5) Mount the CAM PLATE SLIDE ASS'Y ② onto the axles ⑥ and ⑦. Do it so that the pin ⑧ gets into the GROOVE 4 of the MODE CAM as shown in Fig. B, and the point ⑨ of the bent-up part into the ACT PLATE SLIDE ASS'Y hole ⑩.
6) Mount the two special washers ① onto the axles ⑥ and ⑦.
7) Mount the REINFORCE BRACKET as instructed in 5-4-1.

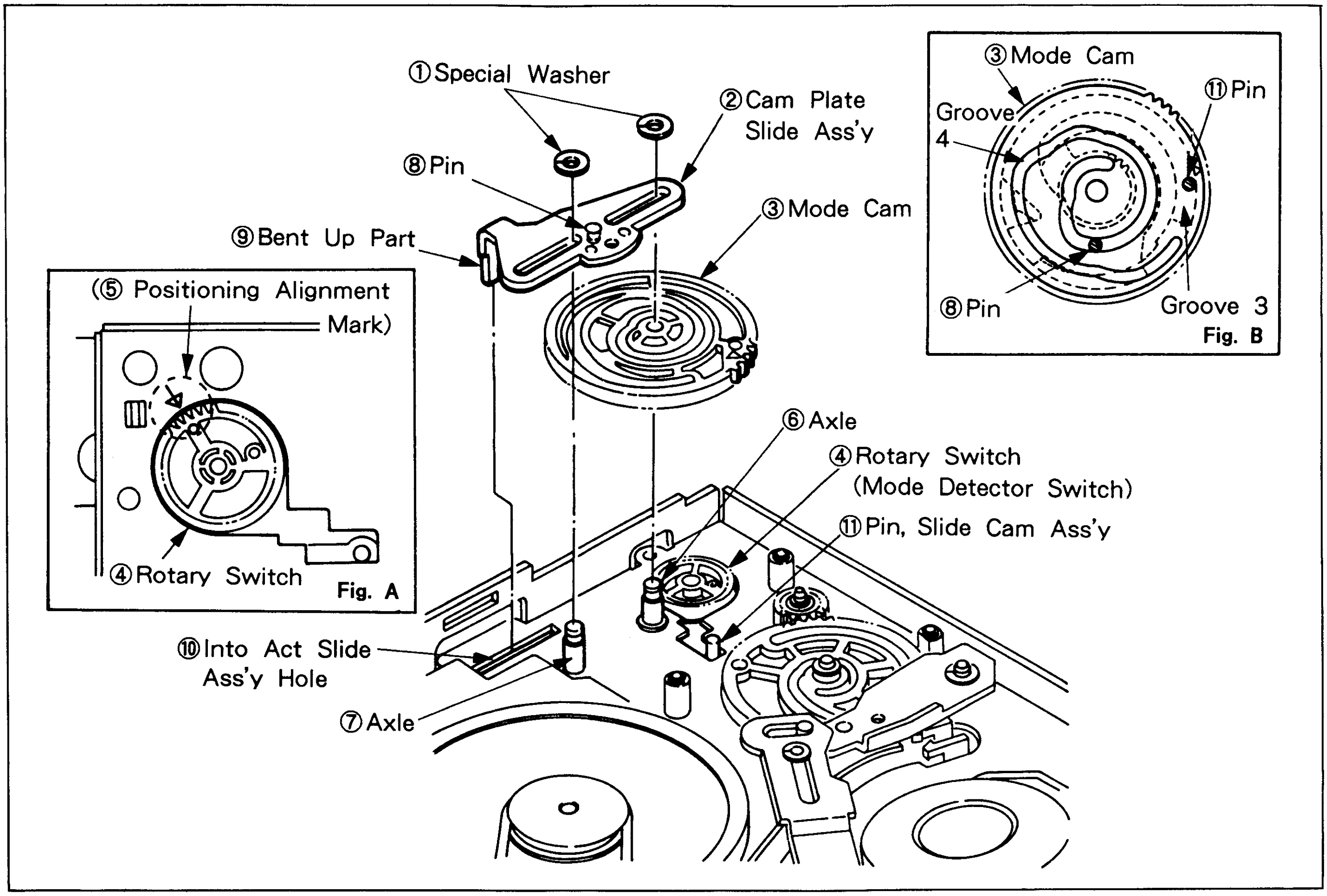

①Special Washer
②Cam Plate Slide Ass'y
⑧Pin
③Mode Cam
⑨Bent Up Part
(⑤ Positioning Alignment Mark)
④Rotary Switch
Fig. A
③Mode Cam
⑪Pin
Groove 4
⑧Pin
Groove 3
Fig. B
⑥Axle
④Rotary Switch (Mode Detector Switch)
⑪Pin, Slide Cam Ass'y
⑩Into Act Slide Ass'y Hole
⑦Axle

Fig. 5-4-2. Mode Cam

## 5-5. COMPL HEAD BRACKET (ACE HEAD) (See Fig. 5-5-1.)

**1. Removal**

1) Remove the COMPL HEAD BRACKET special mounting nut ②.
2) Remove the SPACER ③, the COMPL HEAD BRACKET ① and the ACE HEAD SPRING COIL ④, in that order.

**Note :** Take care not to scratch or soil the ACE head surface.

**2. Remounting**

1) Apply grease to the axle ⑥ as shown in Fig. A.
2) Apply grease to the spot where the COMPL HEAD BRACKET ① makes contact with the STOPPER ⑦ (See Fig. A).
3) Mount the ACE HEAD SPRING COIL ④ and the COMPL HEAD BRACKET ①, in that order, onto the axle ⑥. Hook one end of the ACE HEAD SPRING COIL ④ to the notch ⑤, and the other end to the COMPL HEAD BRACKET, so that the COMPL HEAD BRACKET is pressed against the STOPPER ⑦ (See Fig. A).
4) Mount the SPECIAL NUT ② onto the axle ⑥ through the SPACER ③.
5) Clean the ACE head surface with a chamois leather moistened with methyl alcohol.
6) Perform ACE head adjustment as instructed in 6-4.

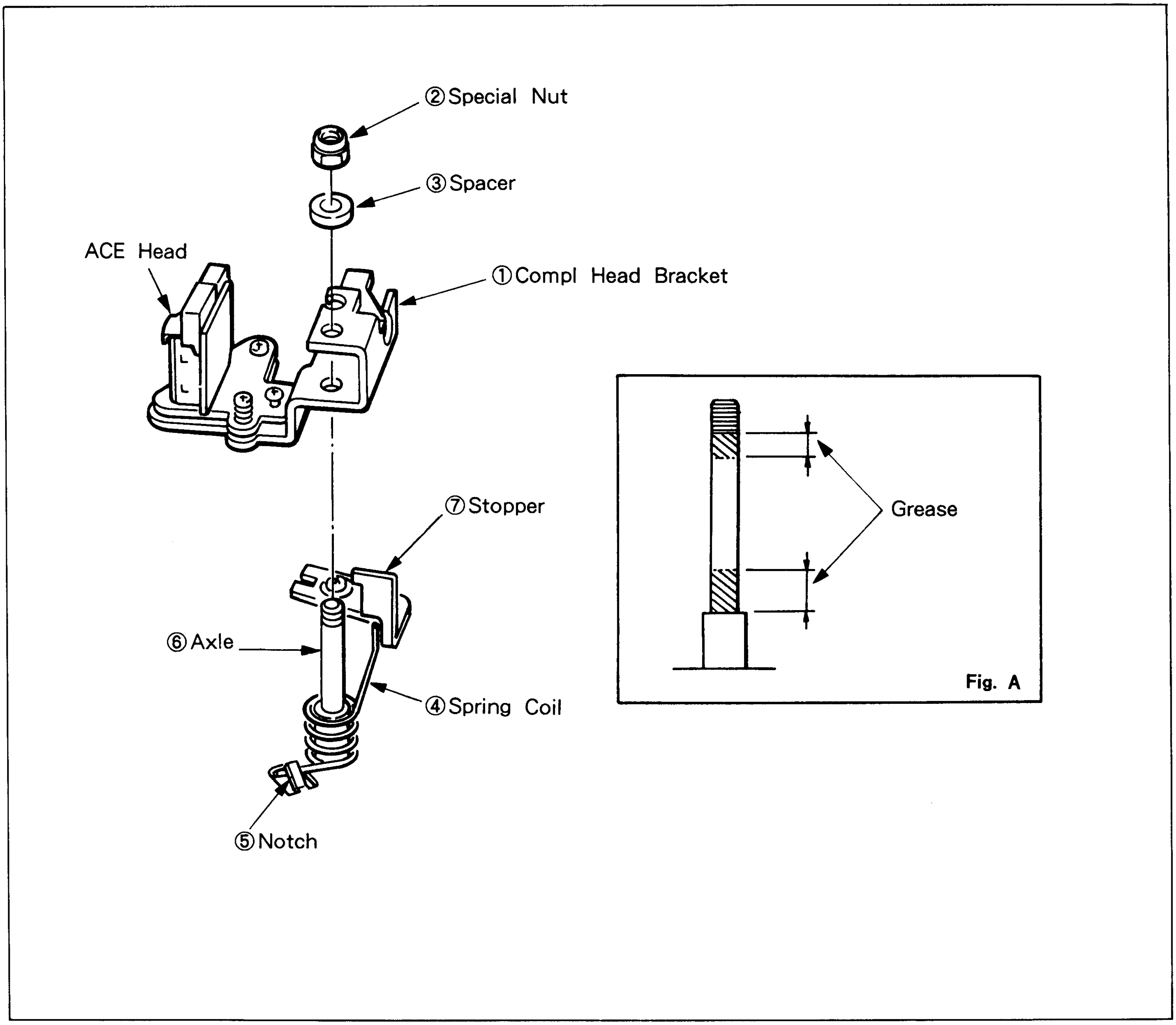

②Special Nut
③Spacer
ACE Head
①Compl Head Bracket
⑦Stopper
⑥Axle
④Spring Coil
⑤Notch
Grease
Fig. A

Fig. 5-5-1. Compl Head Bracket (ACE Head)

## 5-6. PINCH ROLLER PRESSURE MECHANISM (See Fig. 5-6-1.)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the COMPL HEAD BRACKET as instructed in 5-5.
3) Remove the PINCH SPRING COIL ①.
4) Remove the special washer ②, then remove the PINCH LEVER ASS'Y ③.
5) Remove the REV GUIDE LEVER SPRING COIL ④.
6) Remove the REV GUIDE LEVER ASS'Y ⑥ from the plastic molding bearing hook ⑤ at the bottom. Take care not to open the hook too much, otherwise it may be deformed or broken.
7) Remove the LINK LOCK SPRING COIL ⑦.
8) Remove the special washer ⑧, then remove the PINCH CAM LEVER ASS'Y ⑨.
9) Remove the ACT PINCH SLIDE ASS'Y ⑩.

**2. Remounting**

1) Apply grease to pins ⑫/⑬ and axles ⑯/⑱.
2) Apply grease to the ACT PINCH SLIDE ASS'Y pin ⑰.
3) Set the INITIAL mode with the mode selector (VHJ-0050).
4) Mount the ACT PINCH SLIDE ASS'Y ⑩ onto pins ⑫ and ⑬.
5) Insert the pin ⑭ of the PINCH CAM LEVER ASS'Y ⑨ into the MAIN CAM ⑪ GROOVE 1, and mount onto the axle ⑯ while inserting the pin ⑰ of the ACT PINCH SLIDE ASS'Y into the hole ⑮.
6) Mount the special washer ⑧ onto the axle ⑯.
7) Hook the LINK LOCK SPRING COIL ⑦ to the PINCH CAM LEVER ASS'Y ⑨.
8) Mount the REV GUIDE LEVER ASS'Y ⑥ to the plastic molding bearing, then fix it with the hook ⑤ at the bottom.
9) Hook the REV GUIDE LEVER SPRING COIL ④.
10) Mount the PINCH LEVER ASS'Y ③ to the axle ⑱.
11) Mount the special washer ② to the axle ⑱.
12) Hook the PINCH SPRING COIL ① between the ACT PINCH SLIDE ASS'Y ⑩ and the PINCH LEVER ASS'Y ③.
13) Mount the COMPL HEAD BRACKET as instructed in 5-5.
14) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
15) Perform ACE head adjustment as instructed in 6-4.

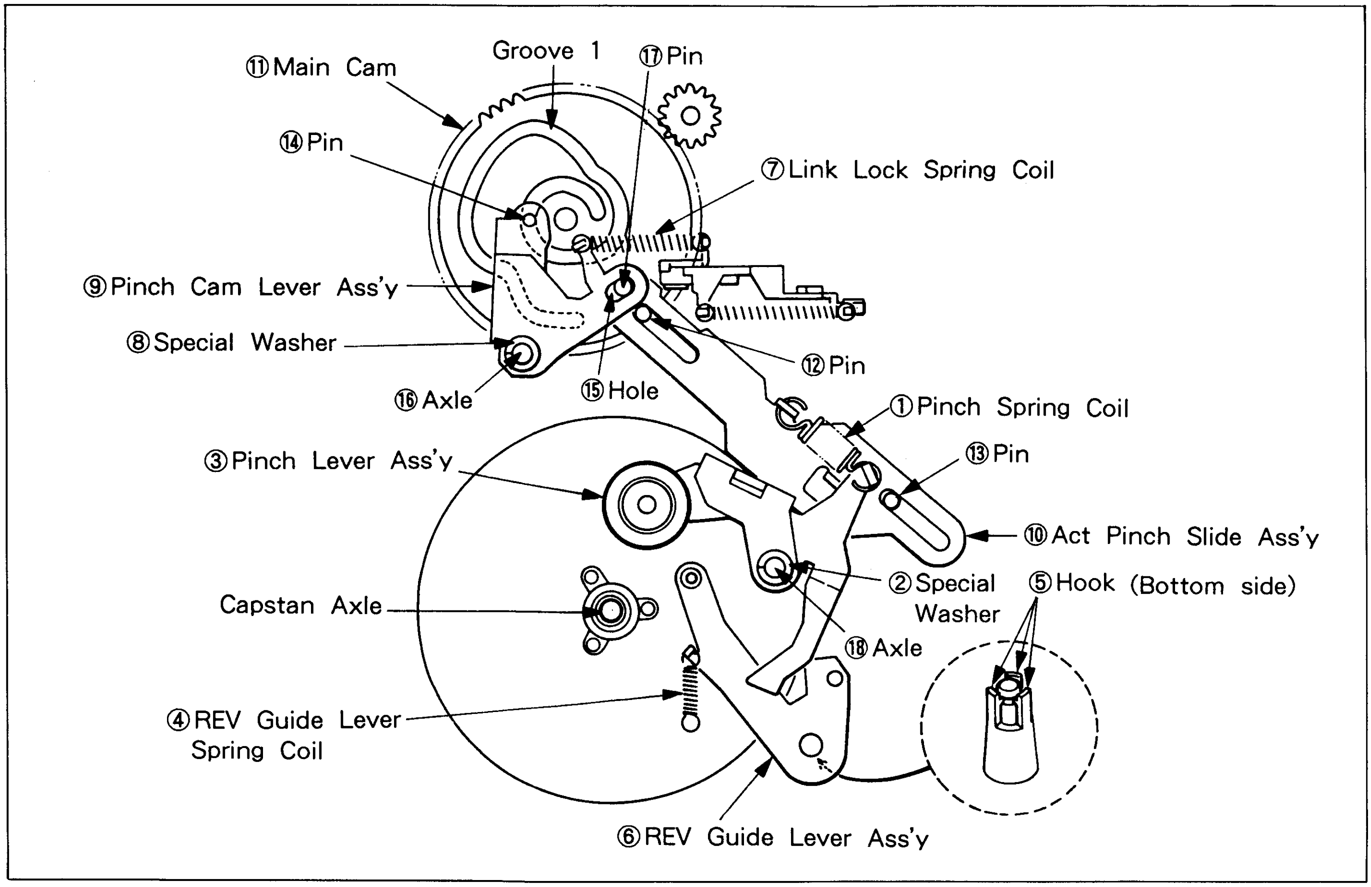

⑪Main Cam
Groove 1
⑰Pin
⑭Pin
⑦Link Lock Spring Coil
⑨Pinch Cam Lever Ass'y
⑧Special Washer
⑫Pin
⑯Axle
⑮Hole
①Pinch Spring Coil
③Pinch Lever Ass'y
⑬Pin
⑩Act Pinch Slide Ass'y
Capstan Axle
②Special Washer
⑤Hook (Bottom side)
⑱Axle
④REV Guide Lever Spring Coil
⑥REV Guide Lever Ass'y

**Fig. 5-6-1. Pinch Roller Pressing Mechanism**

## 5-7. BRAKE MECHANISM

### 5-7-1. Sub Take-up Brake Ass'y (See Fig. 5-7-1.)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SPRING COIL ①.
3) While pushing the hook ② in the direction of arrow, remove the SUB TAKE-UP BRAKE ASS'Y ③.

**2. Remounting**

1) Mount the SUB TAKE-UP BRAKE ASS'Y ③ onto the pin ④. Confirm that the hook ② is firmly hooked to the chassis.
2) Fit the SPRING COIL between hooks ⑤ and ⑥.
3) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

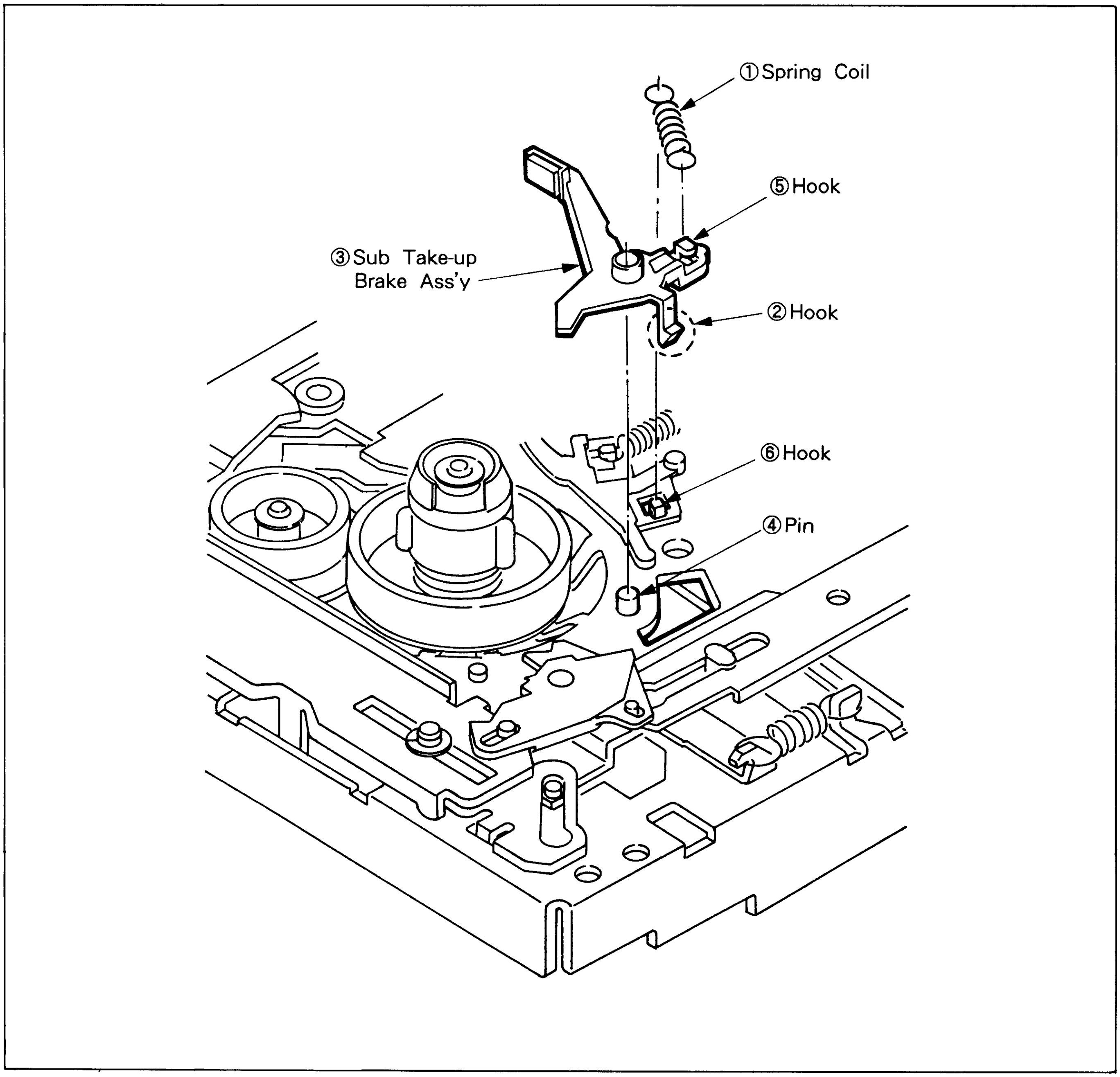

①Spring Coil
⑤Hook
③Sub Take-up Brake Ass'y
②Hook
⑥Hook
④Pin

Fig. 5-7-1. Sub Take-up Brake Ass'y

### 5-7-2. Supply Brake Ass'y and Take-up Brake Ass'y (See Fig. 5-7-2.)

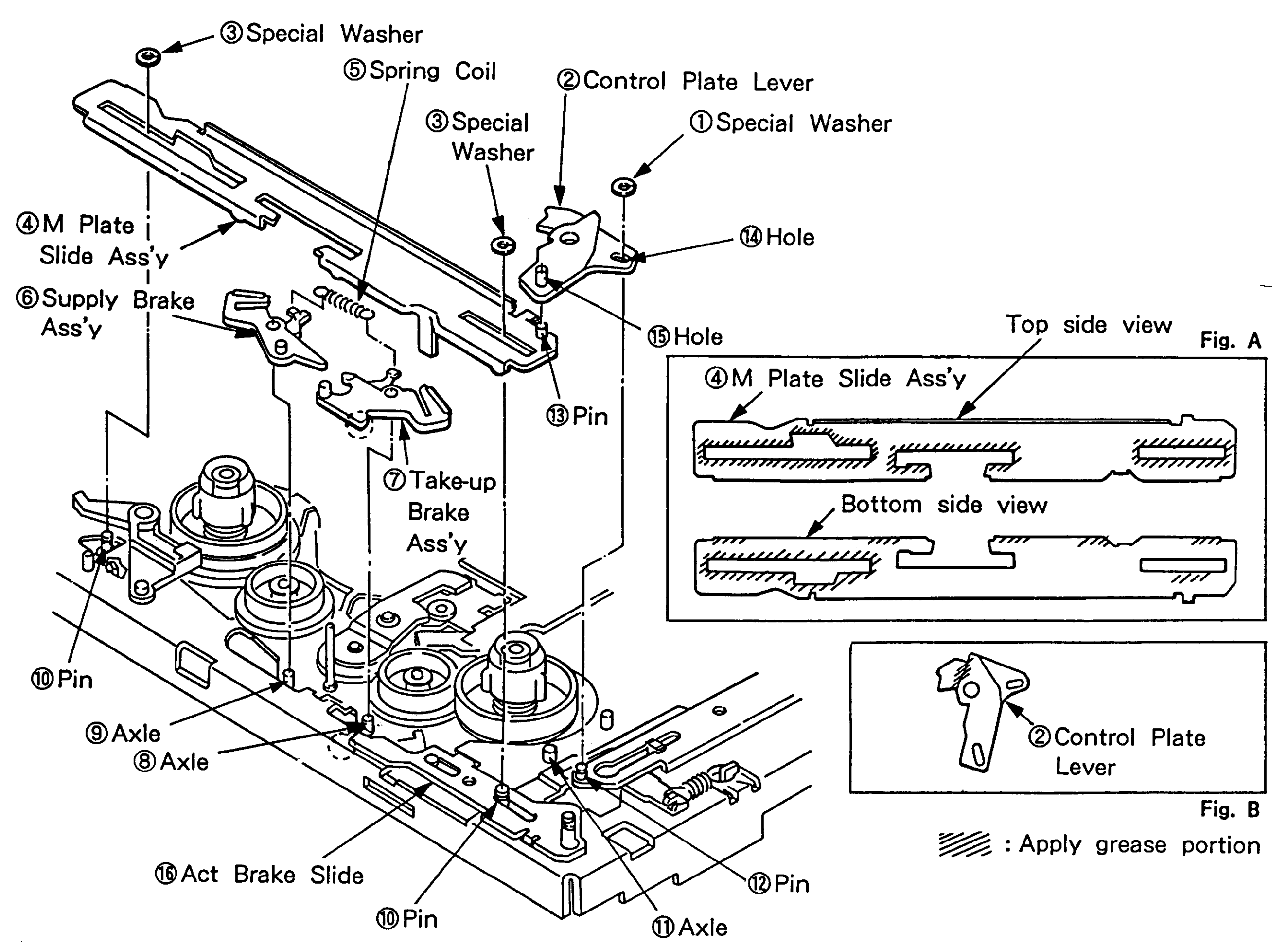
**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SUB TAKE-UP BRAKE as instructed in 5-7-1.
3) Remove the special washer ①, then remove the CONTROL PLATE LEVER ②.
4) Remove the two special washers ③, then remove the M PLATE SLIDE ASS'Y ④.
5) Remove the SPRING COIL ⑤.
6) Remove the SUPPLY BRAKE ASS'Y ⑥ and the TAKE-UP BRAKE ASS'Y ⑦.

**Note :** Take care not to soil the brake shoes.

**2. Remounting**

1) Apply a thin layer of grease to axles ⑧ and ⑨.
2) Mount the TAKE-UP BRAKE ASS'Y ⑦ onto the axle ⑧.
3) Mount the SUPPLY BRAKE ASS'Y ⑥ onto the axle ⑨.
4) After applying a thin layer of grease to the M PLATE SLIDE ASS'Y ④ as shown in Fig. A, mount it onto the two pins ⑩.
5) Mount the two special washers ③ onto the two pins ⑩.
6) After applying grease to the CONTROL PLATE LEVER ② as shown in Fig. B, mount it onto the axle ⑪. Insert the ACT PLATE SLIDE ASS'Y pin ⑫ into the hole ⑭, and the M PLATE SLIDE ASS'Y pin ⑬ into the hole ⑮.
7) Mount the special washer ① onto the pin ⑫.
8) Mount the SUB TAKE-UP BRAKE as instructed in 5-7-1.
9) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.


③Special Washer
⑤Spring Coil
②Control Plate Lever
③Special Washer
①Special Washer
④M Plate Slide Ass'y
⑭Hole
⑥Supply Brake Ass'y
⑮Hole
Top side view
Fig. A
④M Plate Slide Ass'y
⑬Pin
⑦Take-up Brake Ass'y
Bottom side view
⑩Pin
⑨Axle
⑧Axle
②Control Plate Lever
Fig. B
▨ : Apply grease portion
⑯Act Brake Slide
⑫Pin
⑩Pin
⑪Axle

When assembling, the contact surfaces of Take-up Break ⑦ and the Break Slide ⑯ marked with ◌ should contact but not overlap each other.

Fig. 5-7-2. Supply Brake Ass'y & Take-up Brake Ass'y

### 5-7-3. Tension Lever Ass'y and Band Holder Ass'y (See Fig. 5-7-3.)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SPRING COIL ①.
3) Remove the screw ③ fixing the BAND HOLDER ASS'Y ②.
4) Push the SUB SUPPLY BRAKE ④ in the direction of the arrow A, setting the BAND HOLDER ASS'Y ② free.
5) Open the hook ⑤ a little and remove the TENSION LEVER ASS'Y ⑥. Take care not to open the hook ⑤ too much, otherwise it may be deformed or broken.
6) Remove the hook ⑦ of the BAND HOLDER ASS'Y.

**2. Remounting**

1) Mount the BAND HOLDER ASS'Y hook ⑦ into the TENSION LEVER ASS'Y hole ⑧.
2) Insert the TENSION LEVER ASS'Y axle ⑨ into the hole ⑩ and confirm that the hook ⑤ is hooked.
3) While pushing the SUB SUPPLY BRAKE ④ in the direction of arrow, mount the BAND HOLDER ASS'Y ② with the screw ③.
4) Hook the SPRING COIL ① between the hooks ⑪ and ⑫.
5) Perform TENSION POLE position adjustment as instructed in 6-3.
6) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

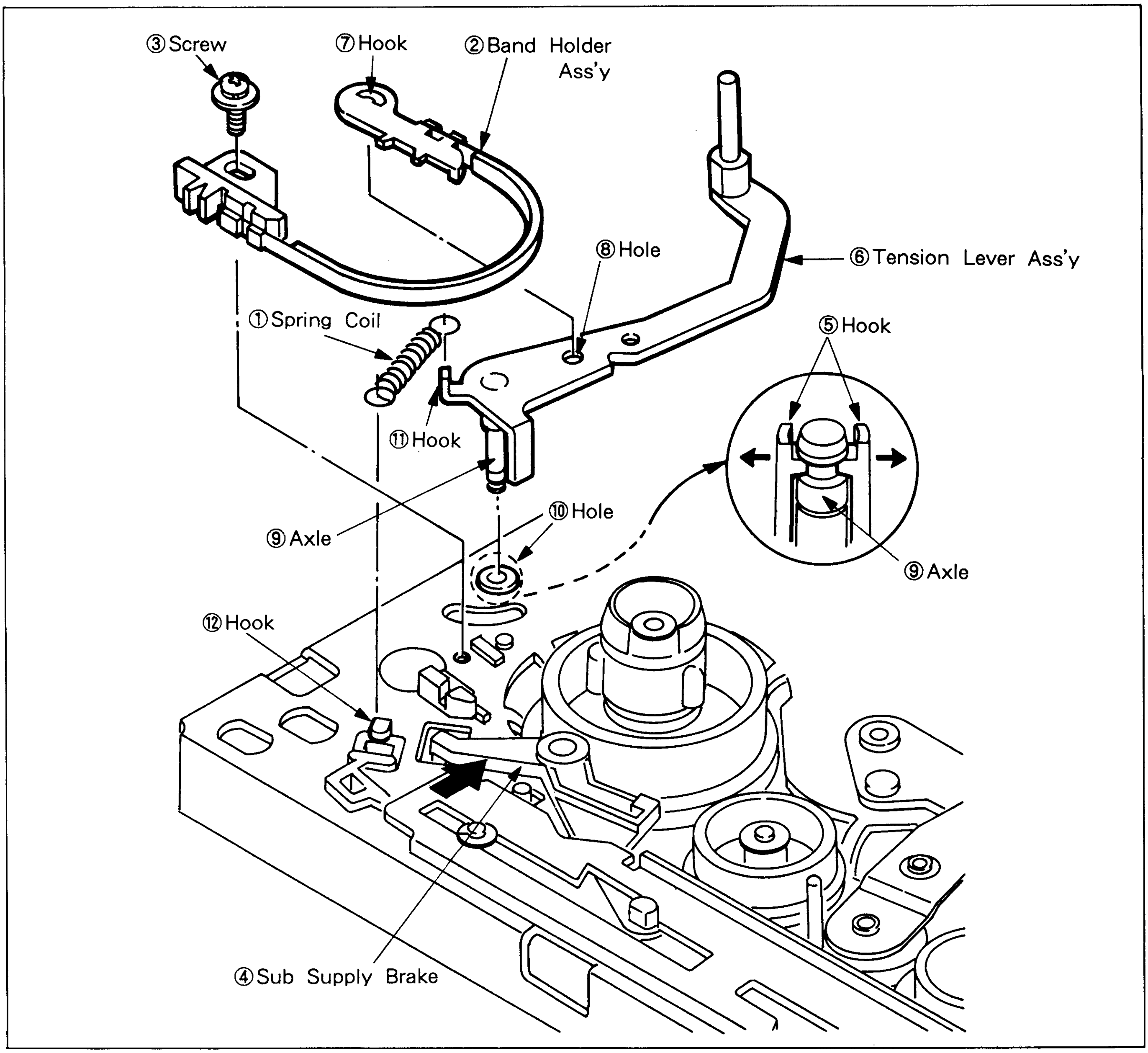

③Screw
⑦Hook
②Band Holder Ass'y
⑧Hole
⑥Tension Lever Ass'y
①Spring Coil
⑤Hook
⑪Hook
⑩Hole
⑨Axle
⑨Axle
⑫Hook
④Sub Supply Brake

Fig. 5-7-3. Tension Lever Ass'y & Band Holder Ass'y

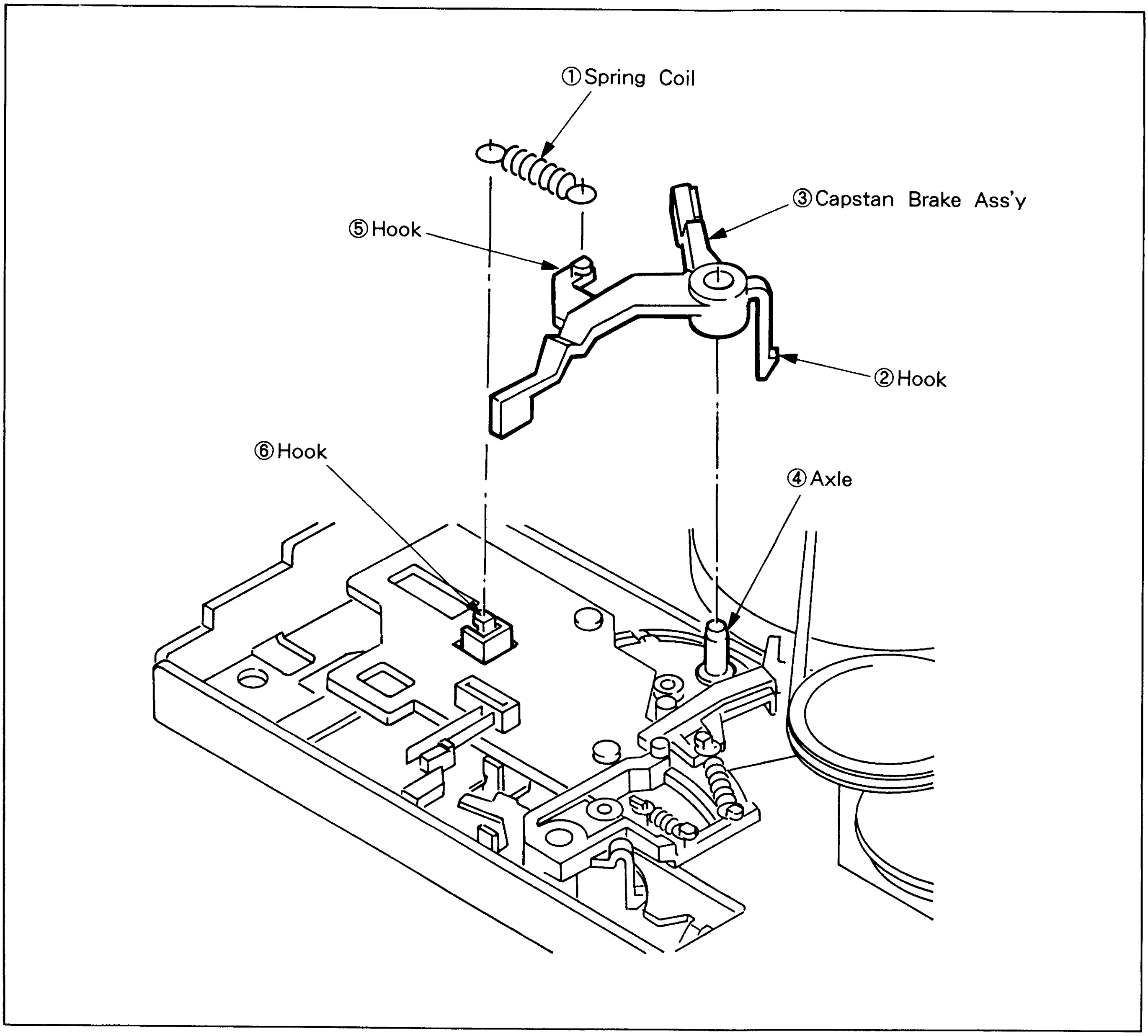
### 5-7-4. Capstan Brake Ass'y (See Fig. 5-7-4.)

**1. Removal**

1) Remove the SPRING COIL ①.
2) Unhook the hook ②, then remove the CAPSTAN BRAKE ASS'Y ③.

**2. Remounting**

1) Mount the CAPSTAN BRAKE ASS'Y ③ onto the axle ④. Confirm that the hook ② is hooked to the chassis.
2) Hook the SPRING COIL ① between hooks ⑤ and ⑥. Fix the hook ⑥ side with adhesive (use an adhesive that allows later detaching).


①Spring Coil
③Capstan Brake Ass'y
⑤Hook
②Hook
⑥Hook
④Axle

5-7-4. Capstan Brake Ass'y

## 5-8. REEL TABLE DRIVE MECHANISM

### 5-8-1. Supply Reel Ass'y and Supply Reel Gear (See Fig. 5-8-1.)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the BAND HOLDER ASS'Y as instructed in 5-7-3.
3) Set the PLAY mode with the mode selector (VHJ-0050).
4) Remove the special washer ①, then remove the SUPPLY REEL ASS'Y ② and the washer ③.
5) Remove the special washer ④.
6) While pushing the SUPPLY BRAKE ASS'Y ⑤ in the direction of arrow A, remove the SUPPLY REEL GEAR ⑥ and the washer ⑦.

**Note :** Be sure that no dirt gets on the section where both brake shoes make contact.

**2. Remounting**

1) Apply a little oil (less than one drop) to the part of the axle ⑧ indicated by the arrow B, then mount the washer ⑦.
2) While pushing the SUPPLY BRAKE ASS'Y ⑤ in the direction of arrow A, mount the SUPPLY REEL GEAR ⑥ onto the axle ⑧.
3) Mount the special washer ④ to the axle ⑧.
4) Apply 1 drop of oil to the part of the axle ⑨ indicated by the arrow C, then mount the washer ③.
5) Mount the SUPPLY REEL ASS'Y ② onto the axle ⑨.
6) Perform reel table height adjustment as instructed in 6-2-1.
7) Mount the special washer ① onto the axle ⑨.
8) Mount the BAND HOLDER ASS'Y as instructed in 5-7-3.
9) Perform tension pole position adjustment as instructed in 6-3.
10) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

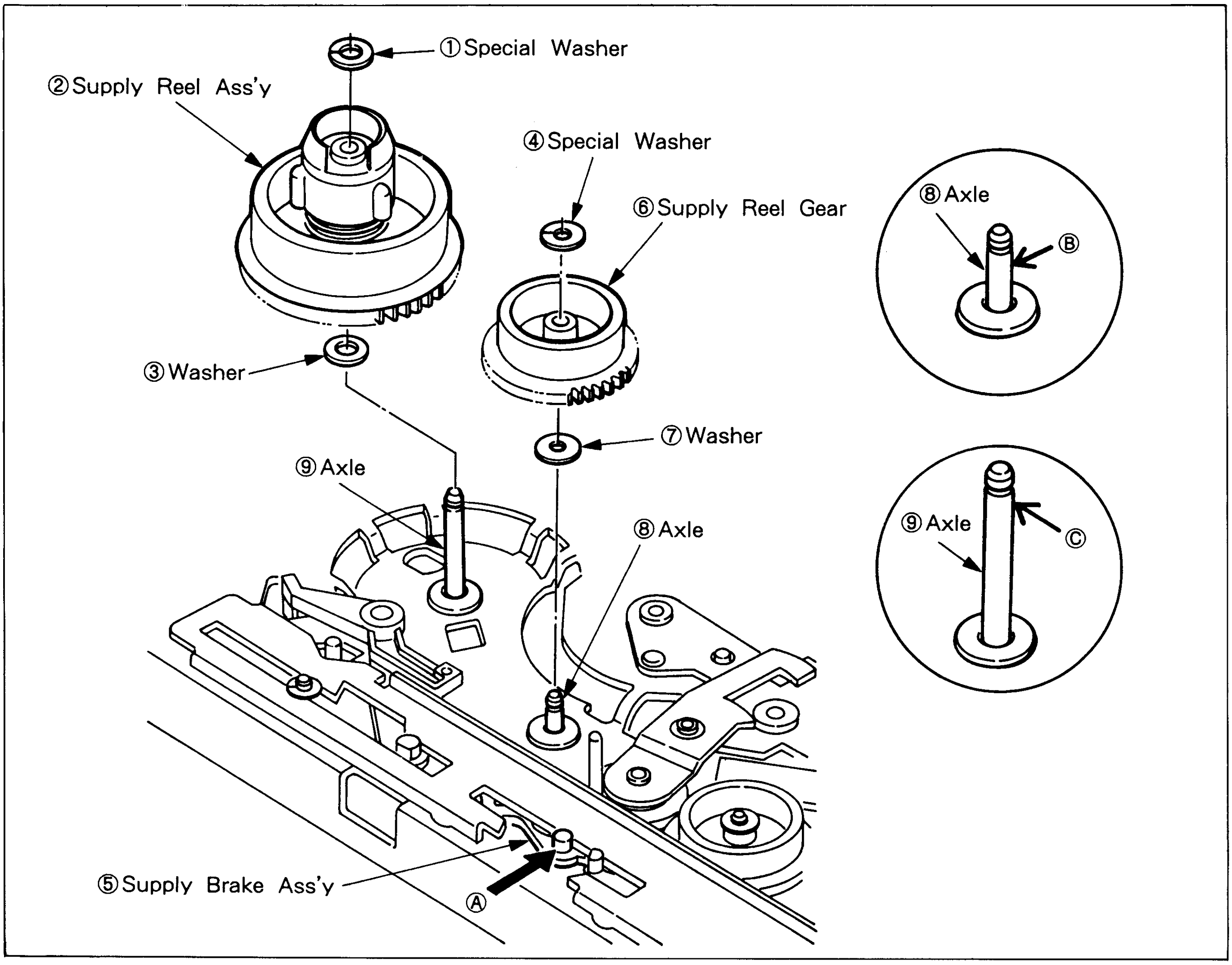


Fig. 5-8-1. Supply Reel Ass'y & Supply Reel Gear

### 5-8-2. Take-up Reel Ass'y (See Fig. 5-8-2.)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the special washer ①.
3) Push the SUB TAKE-UP BRAKE ASS'Y ② in the direction of arrow A to release the brake, then remove the TAKE-UP REEL ASS'Y ③ and the washer ④.

**Note :** Be sure that no dirt gets on the section where both brake shoes make contact.

**2. Remounting**

1) Apply 1 drop of oil to the part of the axle ⑤ indicated by the arrow B, then mount the washer ④.
2) While pushing the SUB TAKE-UP BRAKE ASS'Y ② in the direction of arrow A, mount the TAKE-UP REEL ASS'Y ③ onto the axle ⑤.
3) Perform reel table height adjustment as instructed in 6-2.
4) Mount the special washer ① onto the axle ⑤.
5) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

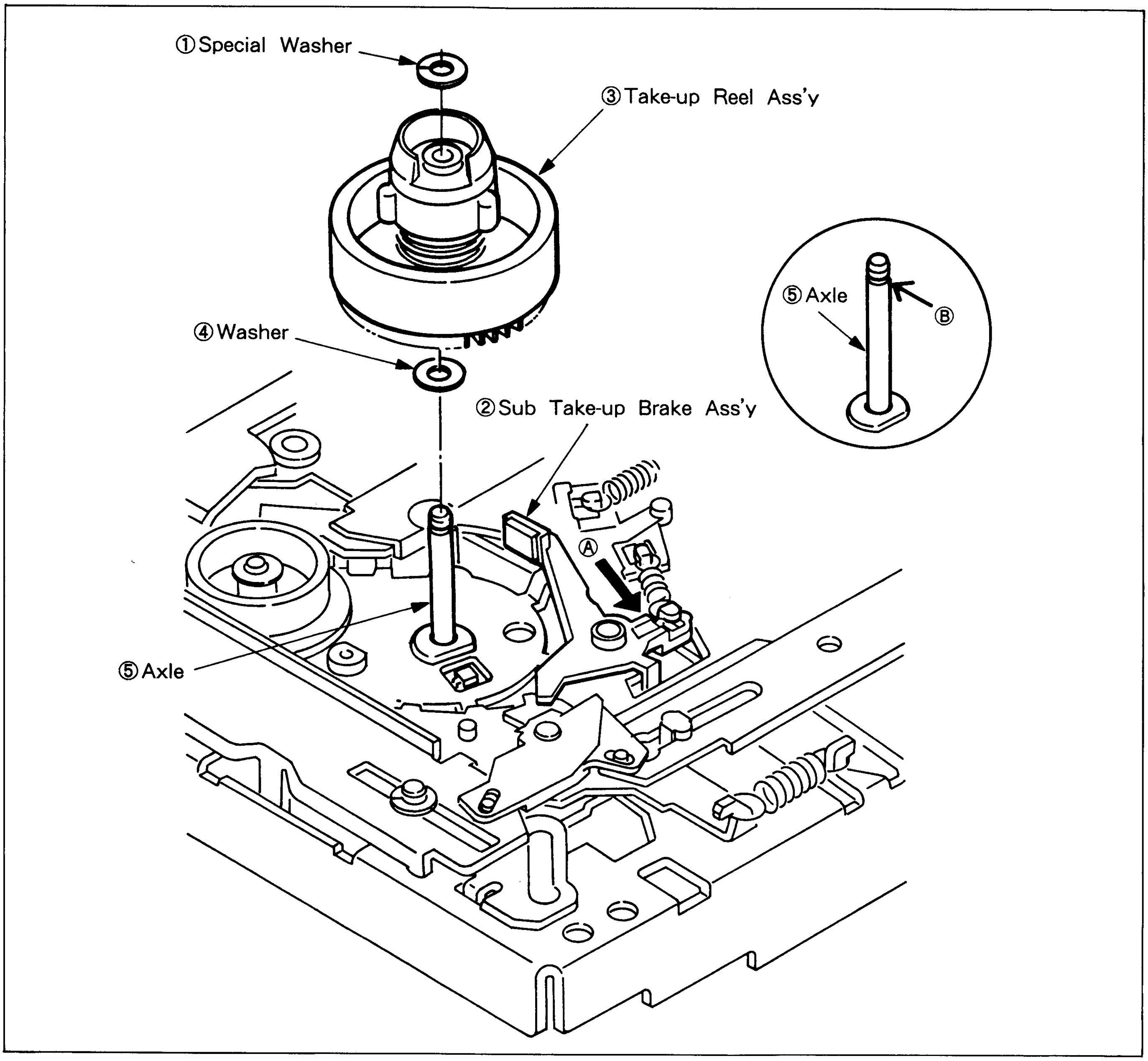


Fig. 5-8-2. Take-up Reel Ass'y

### 5-8-3. Take-up Reel Gear (See Fig. 5-8-3.)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the TAKE-UP REEL ASS'Y as instructed in 5-8-2.
3) Remove the SUB TAKE-UP BRAKE ASS'Y as instructed in 5-7-1.
4) Remove the TAKE-UP BRAKE ASS'Y as instructed in 5-7-2.
5) Remove the special washer ①, then remove the TAKE-UP REEL GEAR ③ and the washer ④.

**2. Remounting**

1) Apply a little oil (less than one drop) to the part of the axle ⑤ indicated with an arrow.
2) Mount the washer ④ and the TAKE-UP REEL GEAR ③ onto the axle ⑤.
3) Mount the special washer ① onto the axle ⑤.
4) Mount the TAKE-UP BRAKE ASS'Y as instructed in 5-7-2.
5) Mount the SUB TAKE-UP BRAKE ASS'Y as instructed in 5-7-1.
6) Mount the TAKE-UP REEL ASS'Y as instructed in 5-8-2.
7) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

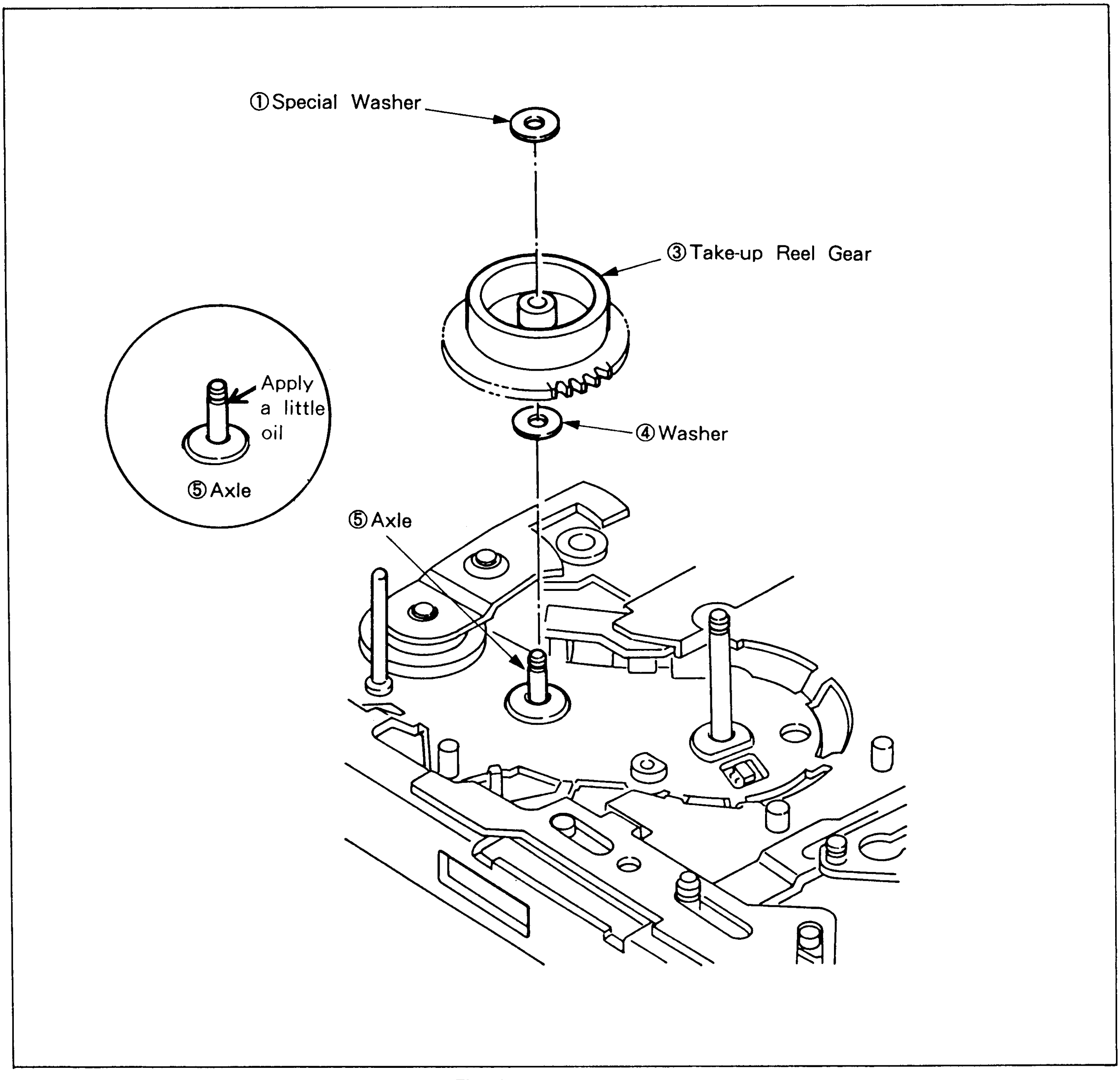


Fig. 5-8-3. Take-up Reel Gear

### 5-8-4. Reel Pulley and Friction Gear Ass'y (See Fig. 5-8-4.)

**1. Removal**

1) Remove the two screws ①, then remove the PULLEY BRACKET ②.
2) Remove the REEL DRIVE BELT ③.
3) Remove the special washer ④, then remove the REEL PULLEY ⑤.
4) Remove the special washer ⑥, then remove the FRICTION GEAR ASS'Y ⑦ and the washer ⑧.

**2. Remounting**

1) Apply one drop of oil to the parts of axles ⑨ and ⑩ indicated with an arrow.
2) Mount the washer ⑧ and the FRICTION GEAR ASS'Y ⑦ onto the axle ⑨.
3) Mount the special washer ⑥ onto the axle ⑨.
4) Mount the REEL PULLEY ⑤ onto the axle ⑩.
5) Mount the special washer ④ onto the axle ⑩.
6) Set the REEL DRIVE BELT ③.
7) Mount the PULLEY BRACKET ② with the two screws ①.

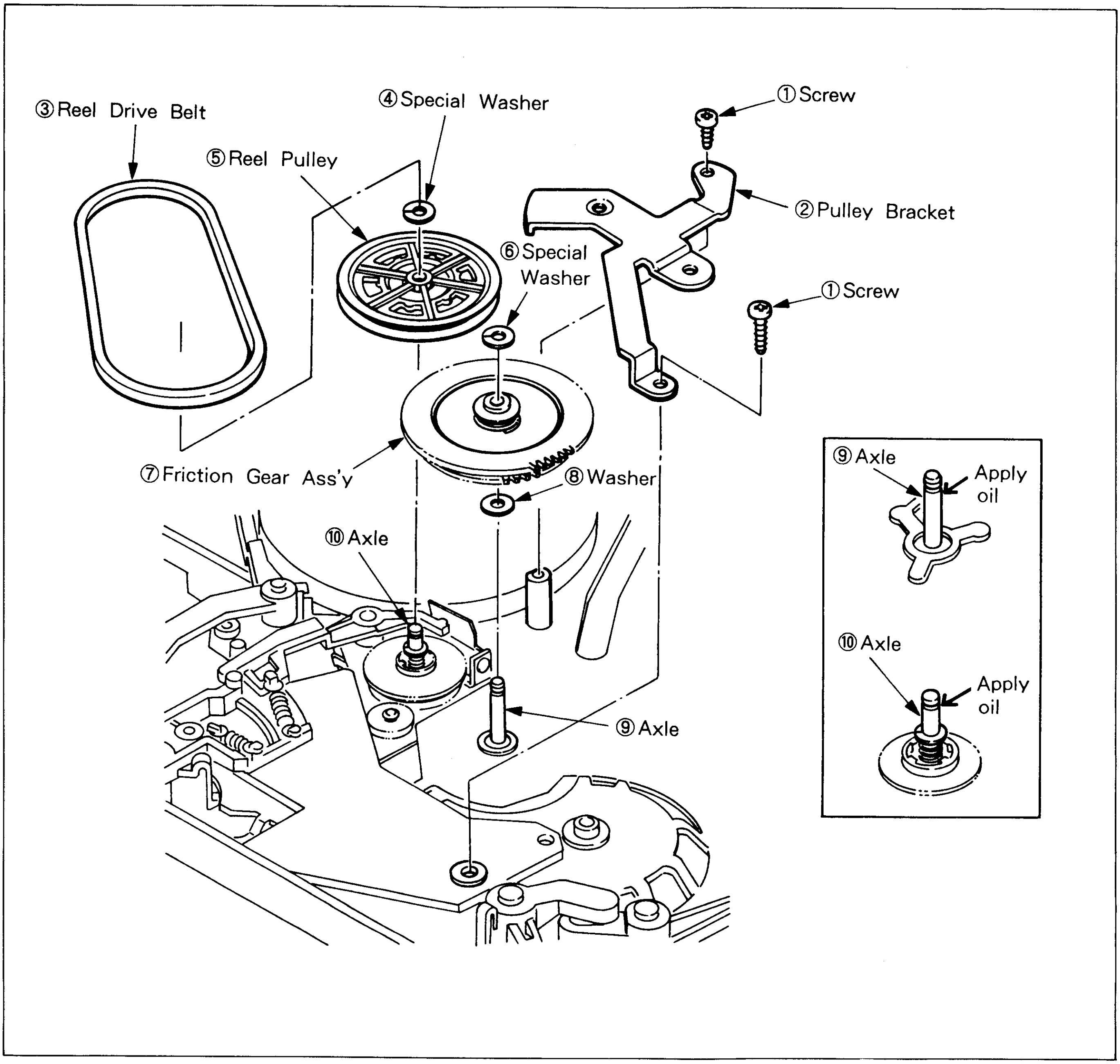

③Reel Drive Belt
④Special Washer
①Screw
⑤Reel Pulley
②Pulley Bracket
⑥Special Washer
①Screw
⑦Friction Gear Ass'y
⑧Washer
⑩Axle
⑨Axle
⑨Axle
Apply oil
⑩Axle
Apply oil

Fig. 5-8-4. Reel Pulley & Friction Gear

### 5-8-5. COMPL Clutch (See Fig. 5-8-5.)

**1. Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
3) Remove the screw ①, then remove the COMPL MC-4 ②.
4) Remove the two screws ③, then remove the COMPL CLUTCH ④.

**2. Remounting**

1) Mount the COMPL CLUTCH ④ with the two screws ③, aligning it with the protuberance ⑤.
2) After inserting the CN831 (COMPL MC-4) into the CN801 (COMPL MC-1), mount the COMPL MC-4 with the screw ①.
3) Mount the REEL PULLEY, the REEL DRIVE BELT and the PULLEY BRACKET as instructed in 5-8-4.
4) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

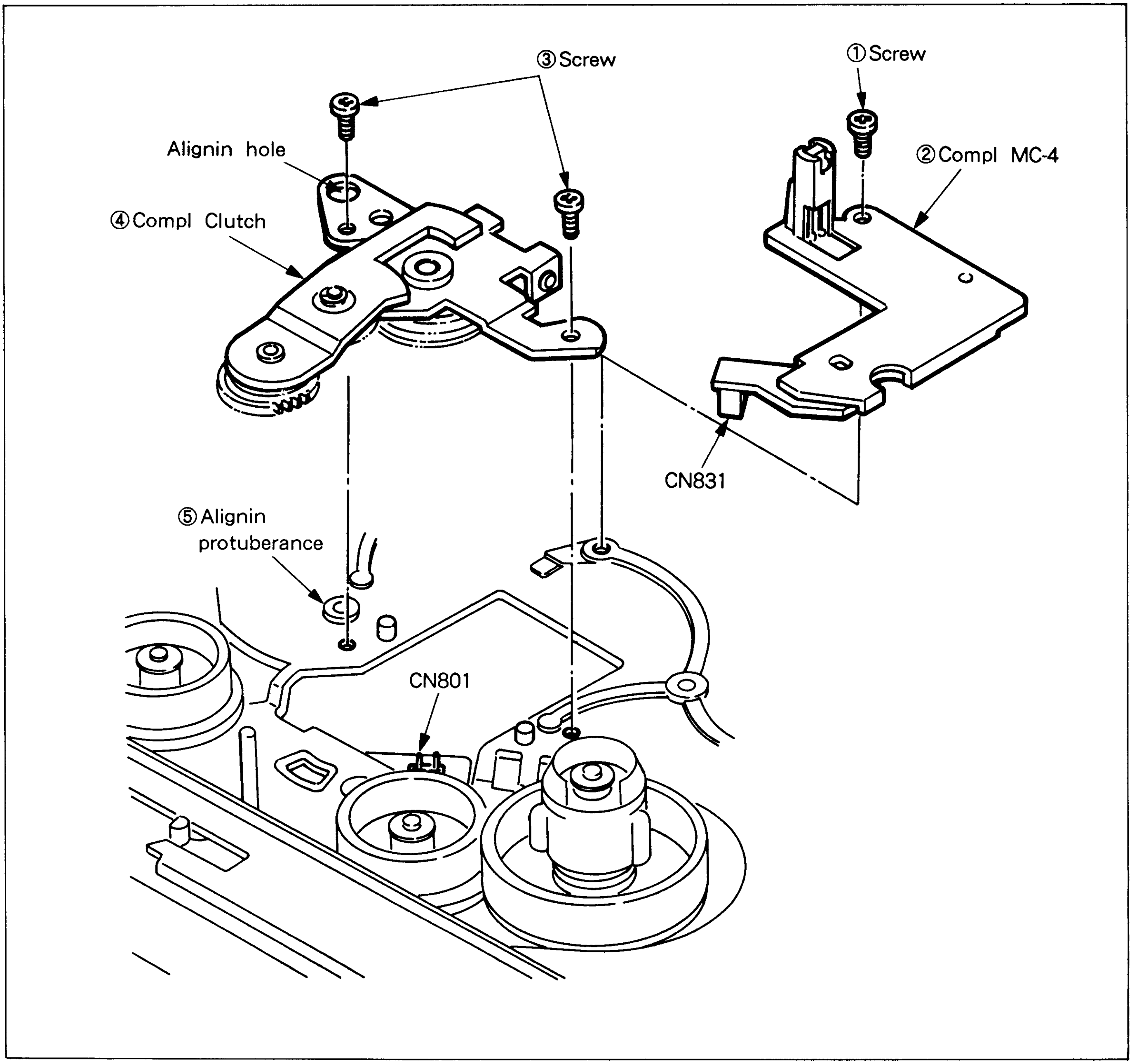

③Screw
①Screw
Alignin hole
②Compl MC-4
④Compl Clutch
CN831
⑤Alignin protuberance
CN801

Fig. 5-8-5. Compl Clutch

### 5-8-6. Clutch Change Lever and Clutch Lever Ass'y (See Fig. 5-8-6.)

**1. Removal**

1) Remove the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.
2) Remove the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
3) Remove the SPRING COIL ①.
4) Unhook the hook ②, then remove the CLUTCH CHANGE LEVER ③.
5) Remove the CS ring ④.
6) Unhook the hook ⑤, then remove the CLUTCH LEVER ASS'Y ⑥.

**2. Remounting**

1) Mount the CLUTCH LEVER ASS'Y ⑥ onto the axle ⑦. Confirm that the hook ⑤ is hooked to the chassis.
2) Mount the CS ring ④ onto the axle ⑦.
3) Mount the CLUTCH CHANGE LEVER ③ onto the axle ⑧. Confirm that the hook ② is hooked to the chassis.
4) Hook the SPRING COIL ① between the hooks ⑨ and ⑩.
5) Mount the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
6) Mount the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.

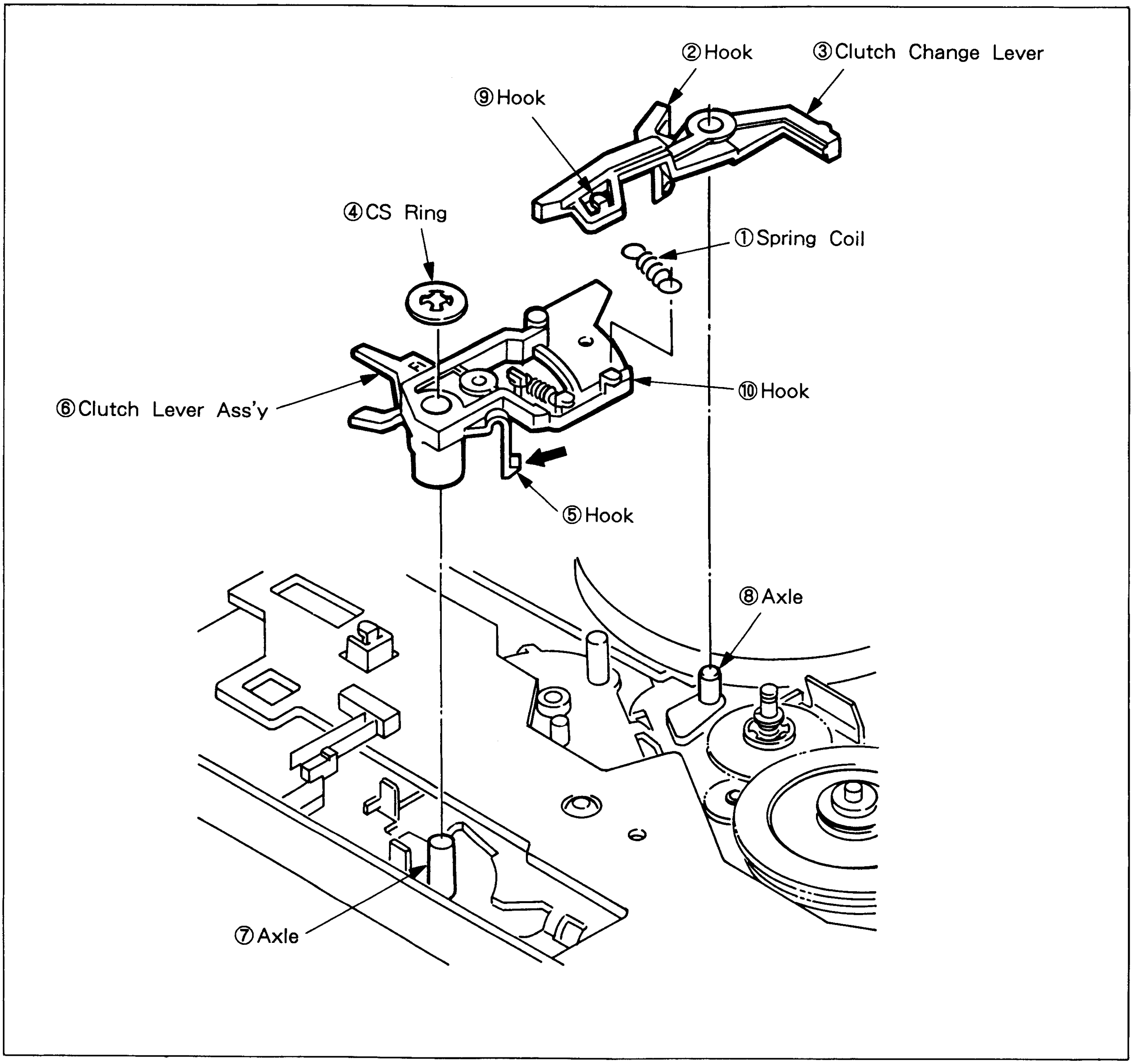

②Hook
③Clutch Change Lever
⑨Hook
④CS Ring
①Spring Coil
⑥Clutch Lever Ass'y
⑩Hook
⑤Hook
⑧Axle
⑦Axle

Fig. 5-8-6. Clutch Change Lever & Clutch Lever Ass'y

## 5-9. CAPSTAN MOTOR (See Fig. 5-9-1.)

### 1. Removal

1) Remove the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.
2) Remove the CAPSTAN MOTOR ⑥ connector.
3) Remove the REEL DRIVE BELT ② from the CAPSTAN MOTOR PULLEY ①.
4) Remove the two screws ④ fixing the COMPL CASSETTE MECHANISM TOP BOARD ③, then slide the TOP BOARD ③ backward.
5) Remove the three screws ⑤, then remove the CAPSTAN MOTOR ⑥.

**Note :** Take care not to scratch or soil the capstan axle.

### 2. Remounting

1) Mount the CAPSTAN MOTOR ⑥ with the three screws ⑤.
2) Connect the CAPSTAN MOTOR ⑥ connector.
3) Mount the TOP BOARD ③ with the two screws ④.
4) Fit the REEL DRIVE BELT ② around the CAPSTAN MOTOR PULLEY ① and the REEL PULLEY ⑦.
5) Mount the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.

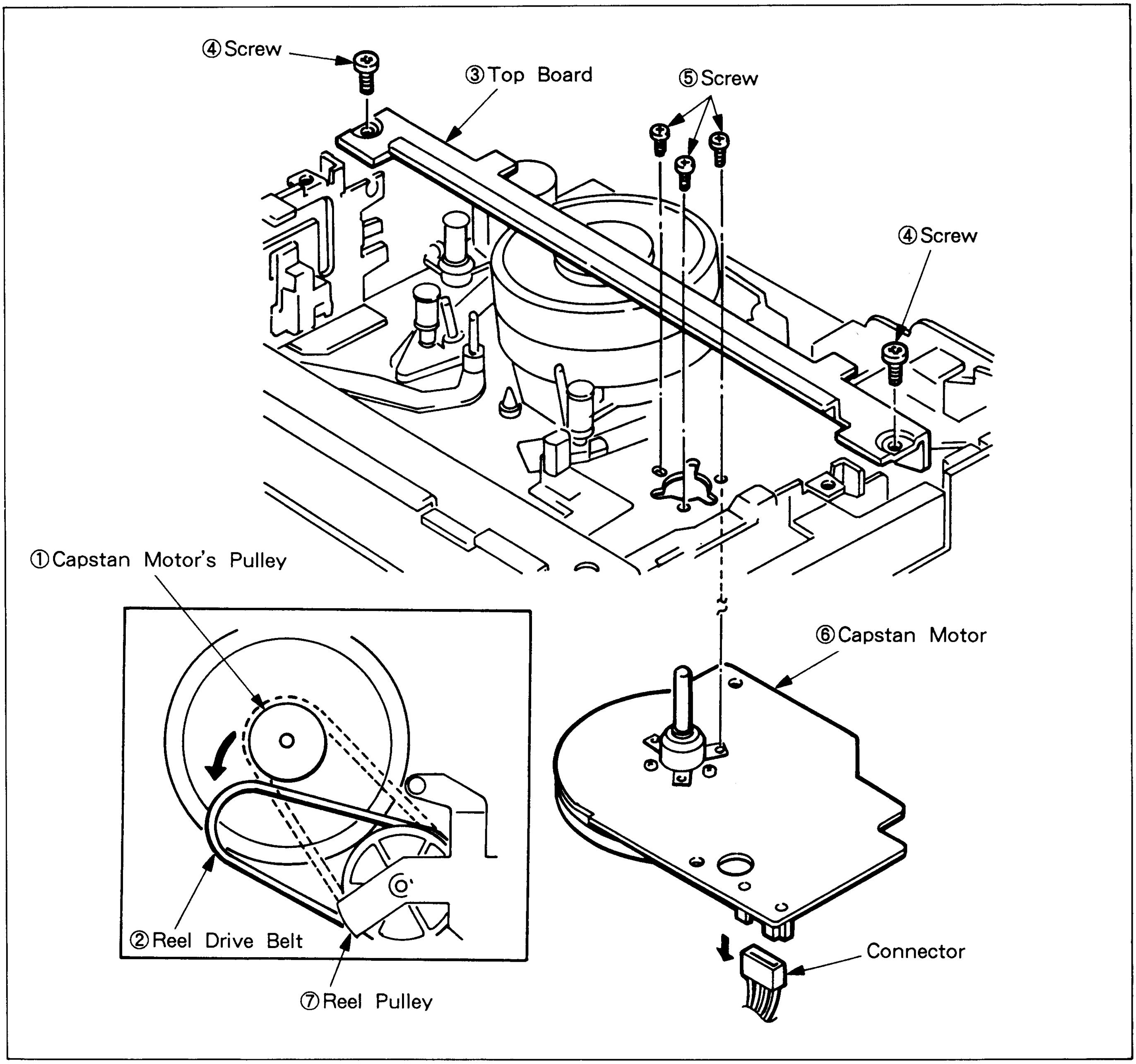

④Screw
③Top Board
⑤Screw
④Screw
①Capstan Motor's Pulley
⑥Capstan Motor
②Reel Drive Belt
⑦Reel Pulley
Connector

**Fig. 5-9-1. Capstan Motor**

## 5-10. FIXED GUIDE, FE HEAD LEVER ASS'Y

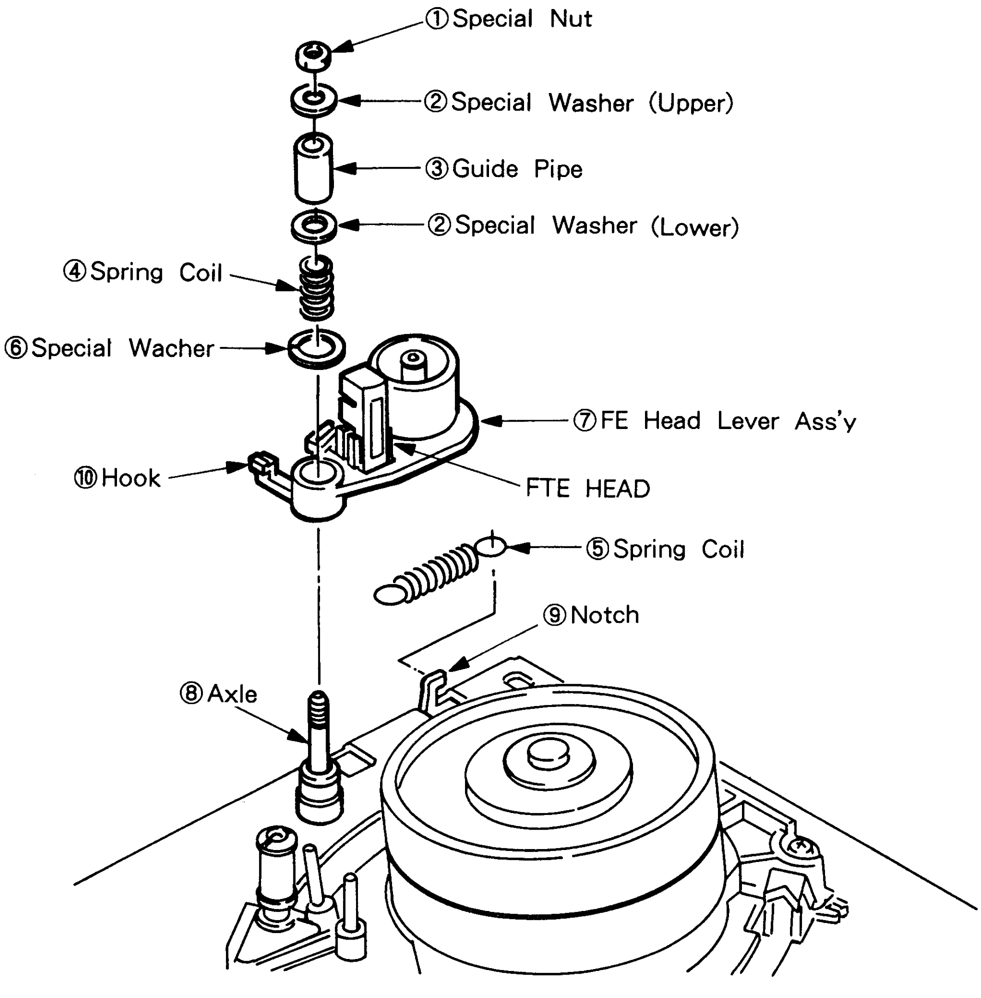
### 5-10-1. S-Side Fixed Guide and FE Lever Ass'y (See Fig. 5-10-1.)

**1. Removal**

1) Remove the SP NUT ①, then remove the SP washer ② (upper), the GUIDE PIPE ③, the SP washer ② (lower) and the SPRING COIL ④, in that order.
2) Remove the SPRING COIL ⑤.
3) Remove the FTE HEAD connector.
4) Remove the special washer ⑥, then remove the FE HEAD LEVER ASS'Y ⑦.

**2. Remounting**

1) After mounting the FE LEVER ASS'Y ⑦ onto the axle ⑧, mount the special washer ⑥.
2) Hook the SPRING COIL ⑤ between the chassis notch ⑨ and the FE LEVER ASS'Y hook ⑩.
3) Connect the SPRING COIL ④, the SP washer ② (lower), the GUIDE pipe ③, the SP washer ② (upper) and the SP NUT ① to the axle ⑧, in that order.
4) Connect the connector to the FTE HEAD.
5) Perform height adjustment of the fixed guide (S) as instructed in 6-4.



①Special Nut
②Special Washer (Upper)
③Guide Pipe
②Special Washer (Lower)
④Spring Coil
⑥Special Wacher
⑦FE Head Lever Ass'y
⑩Hook
FTE HEAD
⑤Spring Coil
⑨Notch
⑧Axle

Fig. 5-10-1. Fixed Guide (S) & FE Lever Ass'y

### 5-10-2. Impedance Roller, FTE Head (See Fig. 5-10-2.)

**1. Removal**

1) Remove the FTE HEAD (full track erase head) ① connector.
2) Remove the special washer ②, then remove the IMPEDANCE ROLLER ③ and the washer ④.
3) Open the hook ⑤ a little and remove the FTE HEAD ①.

**Note :** Take care not to open the hook too much, otherwise it may be deformed or broken.

**2. Remounting**

1) Mount the FTE HEAD ① onto the FE HEAD LEVER ASS'Y ⑥. Confirm that the hook ⑤ is hooked to the FTE HEAD ①.
2) Mount the washer ④ and the IMPEDANCE ROLLER ③, in that order, onto the axle ⑦, then mount the special washer ②.
3) Connect the connector to the terminal of the FTE HEAD ①.

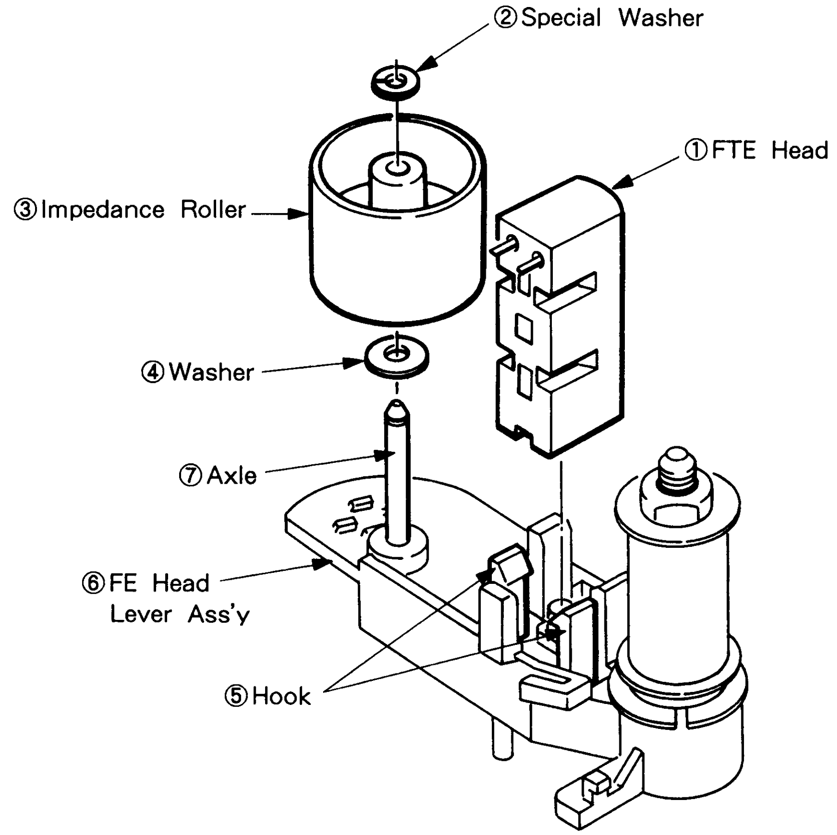

②Special Washer
①FTE Head
③Impedance Roller
④Washer
⑦Axle
⑥FE Head Lever Ass'y
⑤Hook

Fig. 5-10-2. Impedance Roller & FTE Head

### 5-10-3. Fixed (T) Guide (See Fig. 5-10-3.)

**1. Removal**

1) Remove the CAP ①.
2) Remove the SP NUT ②, then remove the SP washer ③ (upper), the GUIDE PIPE ④, the SP washer ③ (lower) and the SPRING COIL ⑤, in that order.

**Note :** Shape of the CAP differ from drawing in the figure depending on the model.

**2. Remounting**

1) Mount the SPRING COIL ⑤, the SP washer ③ (lower), the GUIDE PIPE ④, the SP washer ③ (upper) and the SP NUT ②, in that order, to the axle ⑥.
2) Mount the CAP ① onto the axle ⑥.
3) Perform height adjustment of the fixed guide (T) as instructed in 6-4.

**Note :** In some models, the CAP ① is attached to the SPRING GUIDE ⑦. In this case, place the SPRING GUIDE ⑦ into the guide hole ⑧ of the GUIDE BRACKET screwed to the COMPL CASSETTE MECHANISM as shown in Fig. A.

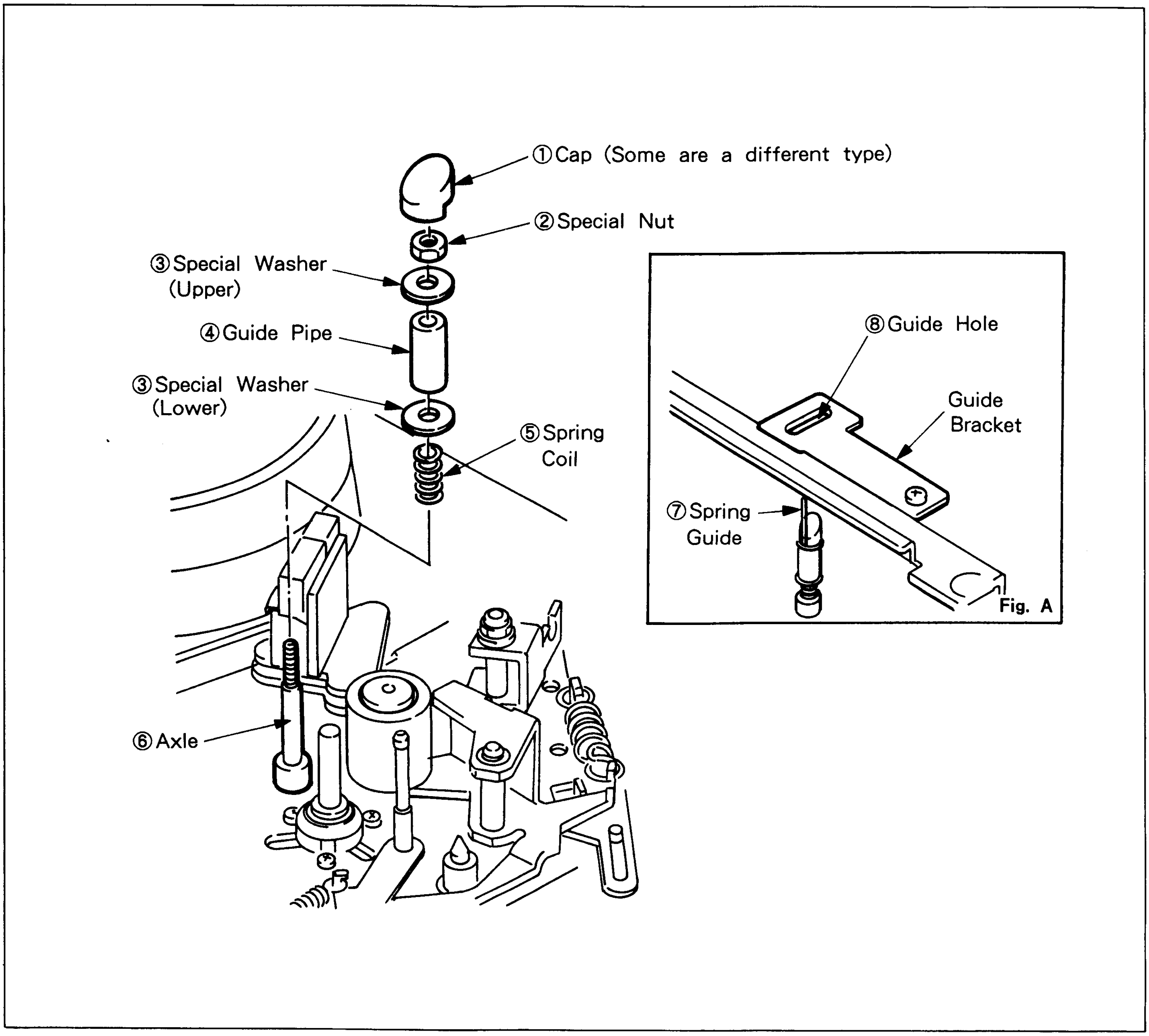

①Cap (Some are a different type)
②Special Nut
③Special Washer (Upper)
④Guide Pipe
③Special Washer (Lower)
⑤Spring Coil
⑥Axle
⑧Guide Hole
Guide Bracket
⑦Spring Guide
Fig. A

Fig. 5-10-3. Fixed Guide (T)

## 5-11. DRUM SECTION

### 5-11-1. Drum Motor (rotor, stator) (See Fig. 5-11-1.)

**1. Removal**

1) Remove the screw ①, then remove the CYLINDER EARTH ASS'Y ②.
2) Remove the two screws ③, then remove the ROTOR ④.
3) Remove the STATOR board connector.
4) Remove the three screws ⑤, then remove the STATOR ⑥.

**2. Remounting**

1) Mount the STATOR ⑥ with the three screws ⑤.
2) While aligning the ROTOR oval hole ⑦ with the ROTOR DISK hole ⑧, mount the ROTOR with the two screws ③.
3) Insert the connector ⑩.
4) While aligning the CYLINDER EARTH ASS'Y ② protuberance with the chassis hole ⑨, mount it with the screw ①.

**Note 1 :** Use a torque driver (VHJ-0014) for mounting the STATOR ⑥ and the ROTOR ④. Set fastening torque to 3kg-cm.

**Note 2 :** When the drum unit has been replaced, perform a tape path adjustment as instructed in 6-4. and perform a CH-1/CH-2 switching position adjustment of the servo circuit.

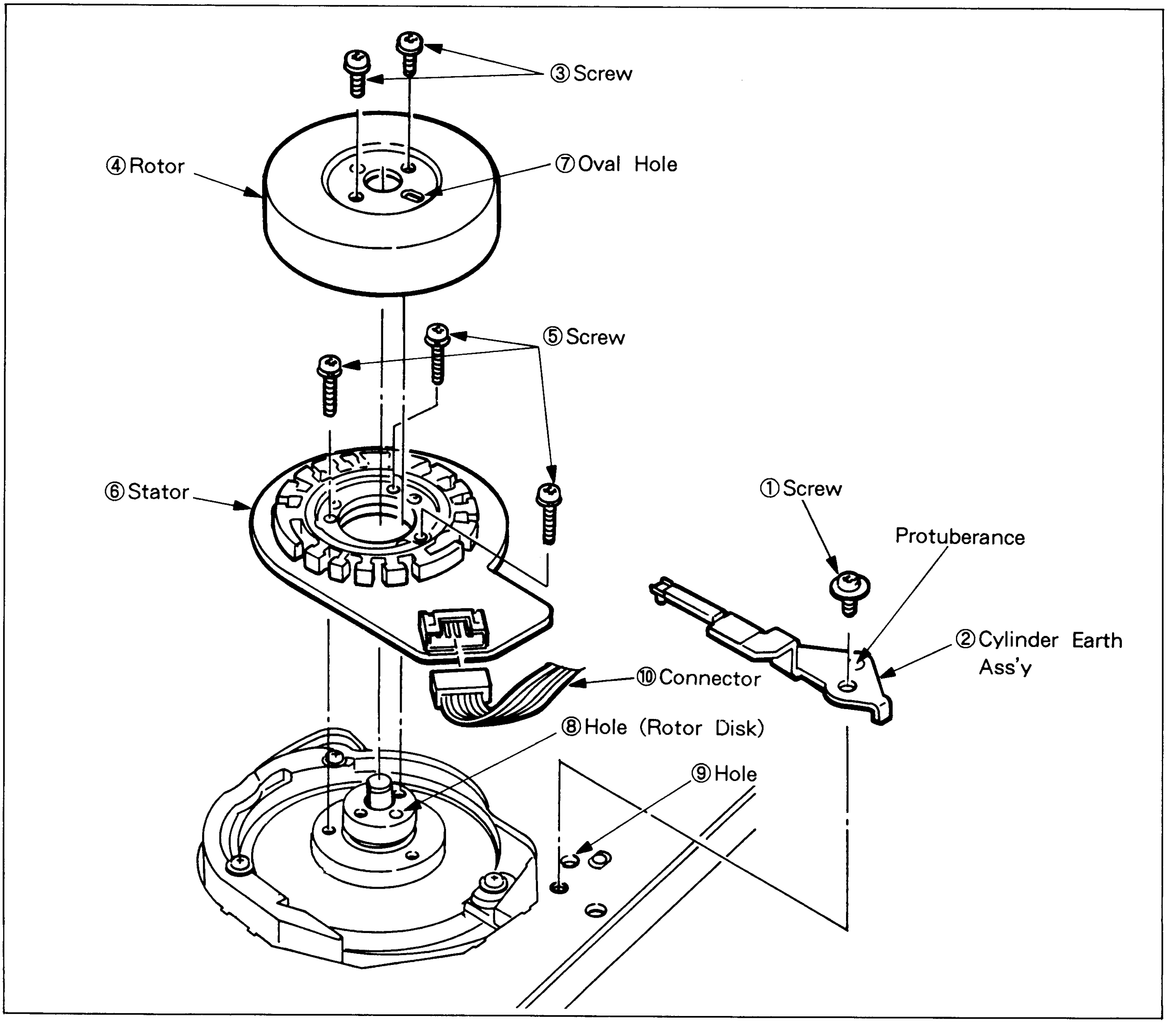

③Screw
④Rotor
⑦Oval Hole
⑤Screw
⑥Stator
①Screw
Protuberance
②Cylinder Earth Ass'y
⑩Connector
⑧Hole (Rotor Disk)
⑨Hole

Fig. 5-11-1. Drum Motor

### 5-11-2. Drum Unit (See Fig. 5-11-2.)

**1. Removal**

1) For some models with the board located above the upper drum, remove the board.
2) Remove the flexible P.C.B. ① from the COMPL VP-1 (take care not to pull the flexible P.C.B. in the upward direction).
3) Remove the LOAD RACK only, as instructed in 5-4-1.
4) Remove the three screws ②, then remove the drum unit ③.

**Note 1 :** A spacer ⑥ is sometimes inserted between the LOWER DRUM (LOWER CYLINDER) ④ and the DRUM BASE (CYLINDER BASE) ⑤. In this case, put it back in its original position when remounting the drum.

**Note 2 :** When removing and remounting the drum unit, handle it carefully to protect it from scratches and dirt.

**2. Remounting**

1) While aligning the drum unit ③ to the protuberance, mount it to the drum base (CYLINDER BASE) ⑤ with the three screws ②.
2) Mount the ROAD RACK as instructed in 5-4-1.
3) Insert the flexible P.C.B. into the COMPL VP-1.
4) Clean the drum unit.
5) Perform the tape path adjustment as instructed in 6-4. and perform the CH-1/CH-2 switching position adjustment of the servo circuit.

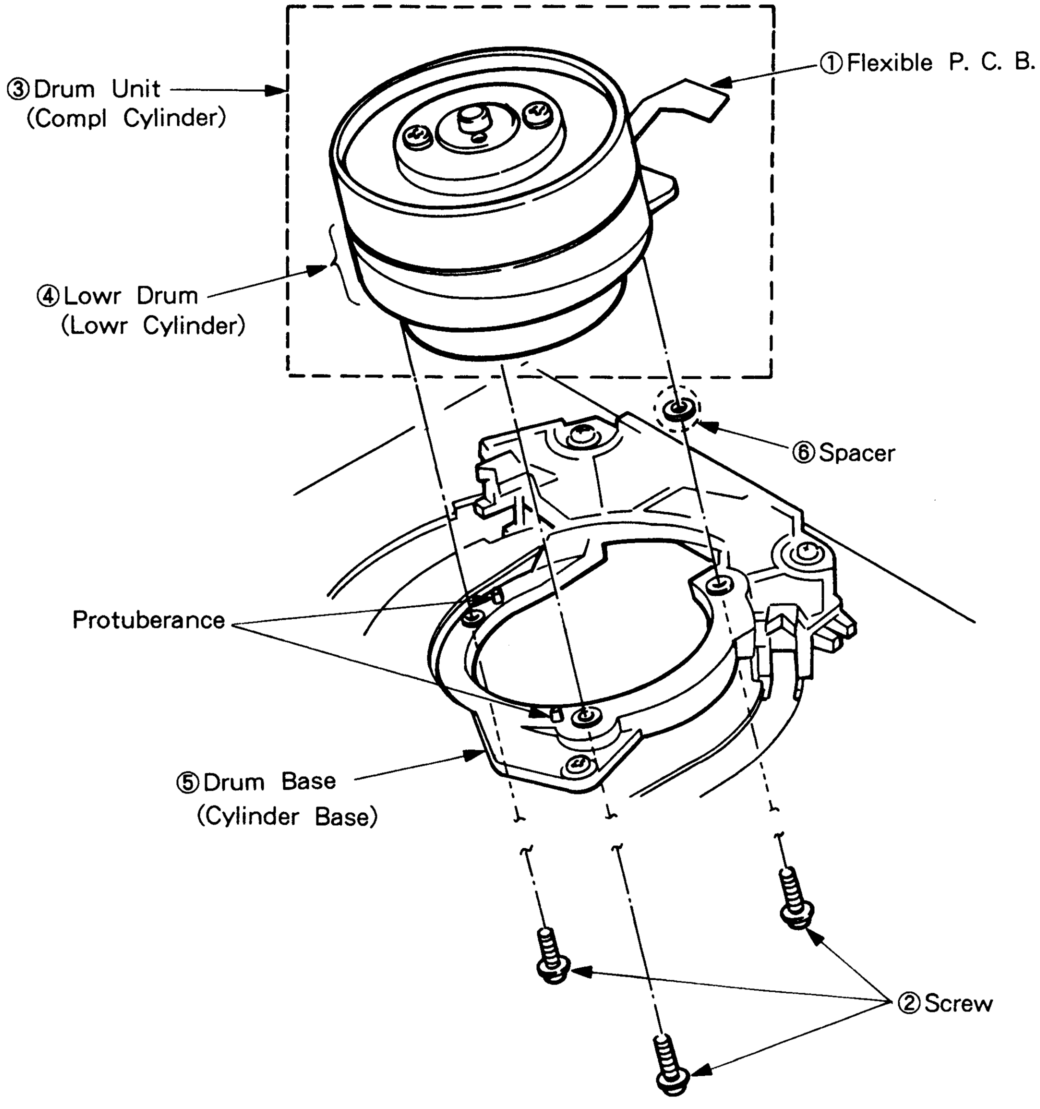

③Drum Unit
(Compl Cylinder)
①Flexible P. C. B.
④Lowr Drum
(Lowr Cylinder)
⑥Spacer
Protuberance
⑤Drum Base
(Cylinder Base)
②Screw

Fig. 5-11-2 Drum Unit (Compl Cylinder)

### 5-11-3. Upper Drum (Upper Cylinder)

**1. Removal**

1) Remove the two screws ① (see Fig. 5-11-3).
2) In case the RE (ROTARY ERASE) HEAD is attached to the upper drum (UPPER CYLINDER), remove the lead wires soldered from the P.C. board (see Fig. 5-11-4.).
3) Turn the head removing jig (VHJ-0041) handle ② counterclockwise to lift up the stopper ③ (see Fig. 5-11-5.).
4) Insert the two long screws ④ of the jig into the screw holes ⑥ located on the head chip side of the upper drum (UPPER CYLINDER) ⑤, then mount by turning the handle clockwise.
5) While holding the jig so that the upper drum ⑤ does not rotate, turn the handle ② clockwise to remove the upper drum.
6) Remove the jig from the upper drum.

**Note :** Handle parts carefully to protect the drum from scratches and dirt, and the video head from damage.

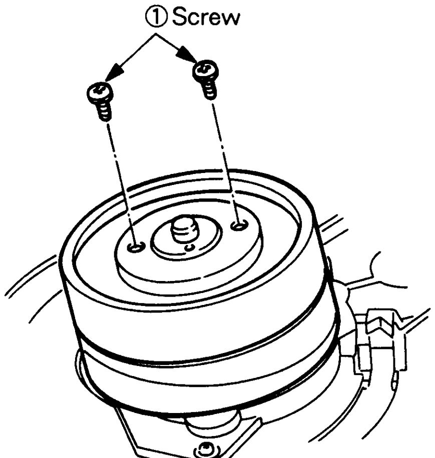


Fig. 5-11-3

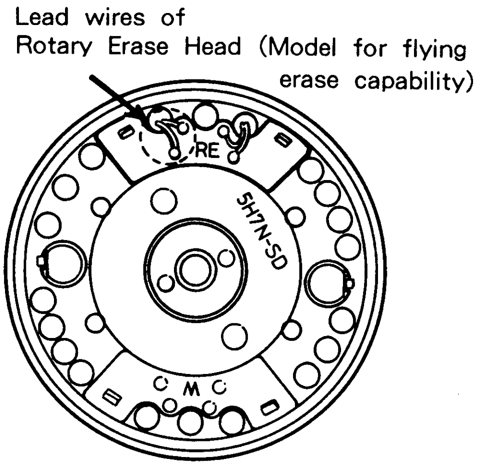

Lead wires of
Rotary Erase Head (Model for flying erase capability)
RE
5H7N-SD
C M C

Fig. 5-11-4

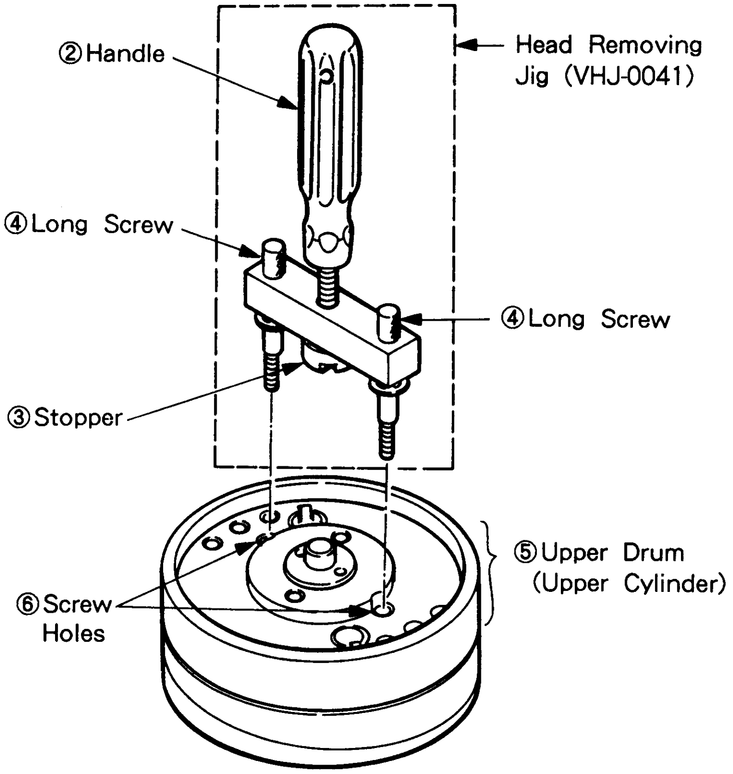

②Handle
Head Removing Jig (VHJ-0041)
④Long Screw
④Long Screw
③Stopper
⑤Upper Drum (Upper Cylinder)
⑥Screw Holes

Fig. 5-11-5

Upper Drum (Upper Cylinder)

**2. Remounting (See Fig. 5-11-6.)**

1) Confirm that surfaces where the flywheel and the upper drum (UPPER CYLINDER) are engaged or make contact portion are free from scratches and dirt.
2) The code name ① of the drum is printed on the video head side of the upper drum ⑤ SP CH-1 (channel A, plus azimuth). The code name ① is set with in the rotary transformer terminal round hole side ② position of lower drum (LOWER CYLINDER), so that the two screw holes ③ of the upper drum are aligned with the two screw holes ④ of the flywheel. (Refer to 3. Recognizing the SP CH-1 Head side).
3) In case the RE (ROTARY ERASE) HEAD is attached to the upper drum, pass the lead wires through the lead wire hole. (See Fig.5-11-4.)
4) While keeping the upper drum ⑤ parallel to the lower drum (LOWER CYLINDER) ⑧, insert it completely into the flywheel.
5) Temporarily tighten the two screws ⑦ alternately a little at a time, then tighten them to a torque of 6kg-cm using a torque driver (VHJ-0014) and a 3mm bit (VHJ-0045).
6) In case the RE head is attached to the upper drum ⑤, solder the lead wires to the P.C. board. Solder the red lead wire to the R terminal, and the yellow lead wire to the Y terminal.

**Note :** When the upper drum has been replaced, perform a tape path adjustment as instructed in 6-4. and CH-1/CH-2 switching position adjustment of the servo circuit.

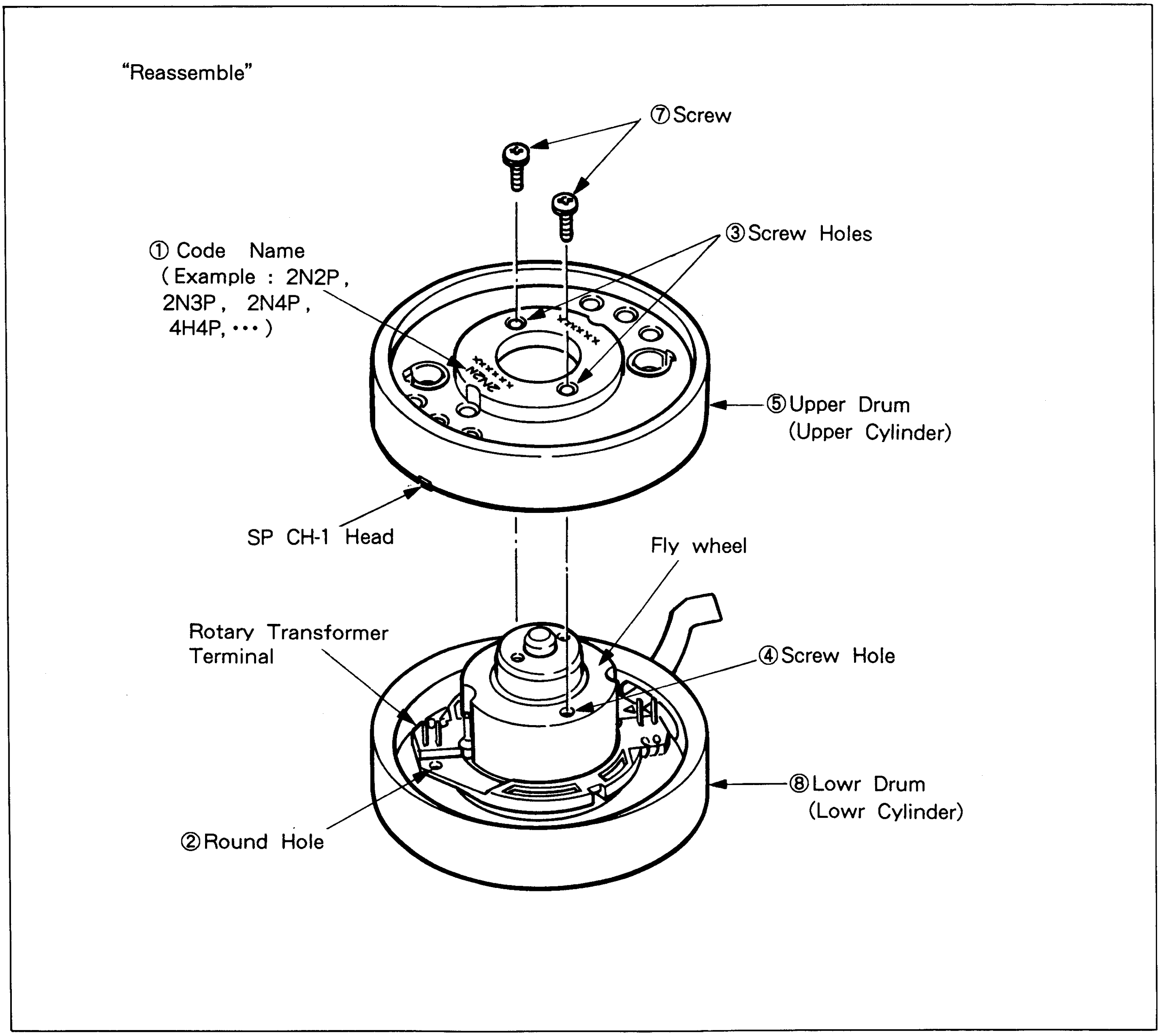
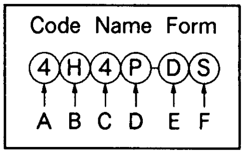

"Reassemble"
⑦Screw
① Code Name (Example : 2N2P, 2N3P, 2N4P, 4H4P, •••)
③Screw Holes
⑤Upper Drum (Upper Cylinder)
SP CH-1 Head
Fly wheel
Rotary Transformer Terminal
④Screw Hole
⑧Lowr Drum (Lowr Cylinder)
②Round Hole

Fig. 5-11-6

3. **Recognizing the SP CH-1 Head Side**
No playback picture can be obtained if the video head is not wired as a pair with the rotary transformer located inside the lower drum rotating section. Therefore, mounting position should be matched when mounting the upper drum. In the P88 mechanism series, the code name of the drum is printed on the SP CH-1 (CH-A, plus azimuth) side as a mark for mounting the upper drum. (See Fig. 5-11-7.) This code name differs according to the drum type, but its basic form is as follows :


Code Name Form
4
H
4
P
D
S
A
B
C
D
E
F

A = Number of head bases
B = "N" for normal audio
"H" for HI-FI audio
C = Number of heads
D = TV system ("N" or "P")
EF = Code for detailed classification. Depending on drum type, it can also be just one character, or a blank space.

Examples of Detailed Classification Codes
V = Head with level difference
D = Compatible with digital units
S = SVHS-compatible

Examples of Code Names
2N2P, 2N2P-L, 2N2P-V, 2N2P-D, 2N3P, 2N4P, 4H4P, 4H4P-D

Moreover, there is a round hole with marking purposes on the SP CH-1 (CH-A, plus azimuth) side of the lower drum rotary transformer terminal. As shown in Fig. 5-11-8, there are two types of rotary transformer terminals (the number of pins differs according to the number of heads).

**Note** : When ordering parts such as drums (CYLINDERS), do not use the code names; always refer to the parts list and order with the specified part numbers.

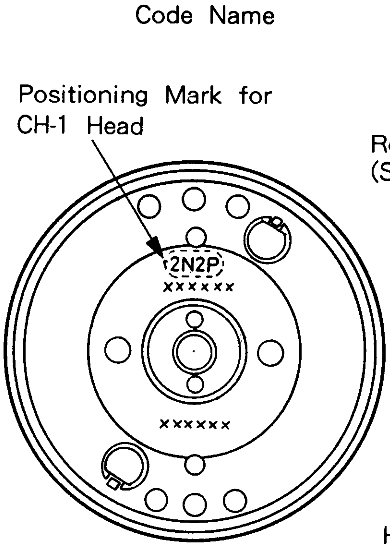

Code Name
Positioning Mark for CH-1 Head
2N2P
xxxxxx
xxxxxx

**Fig. 5-11-7. Upper Drum**

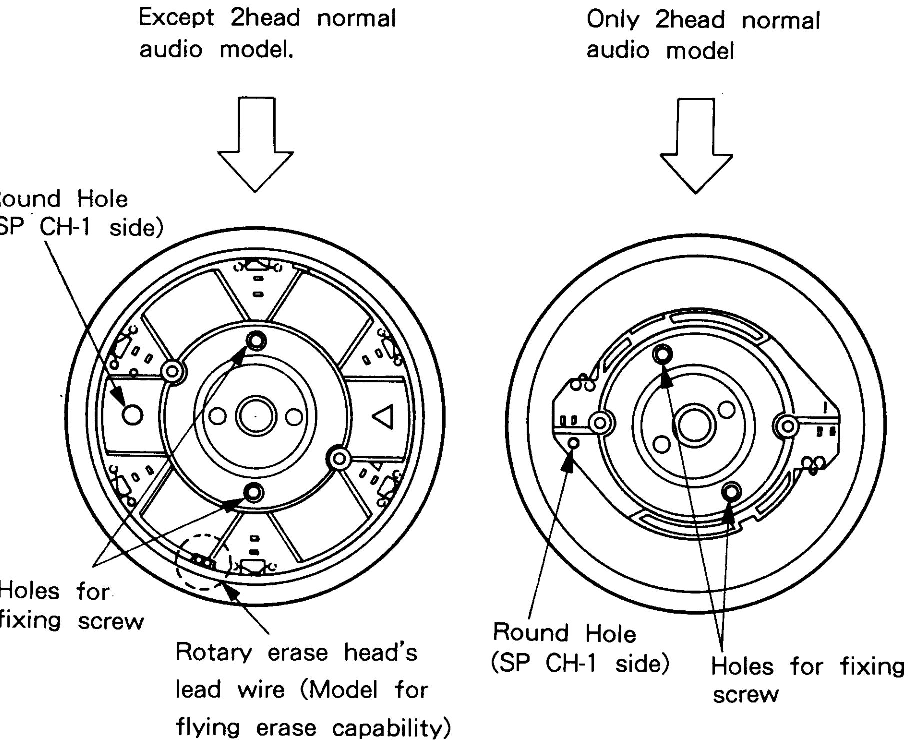
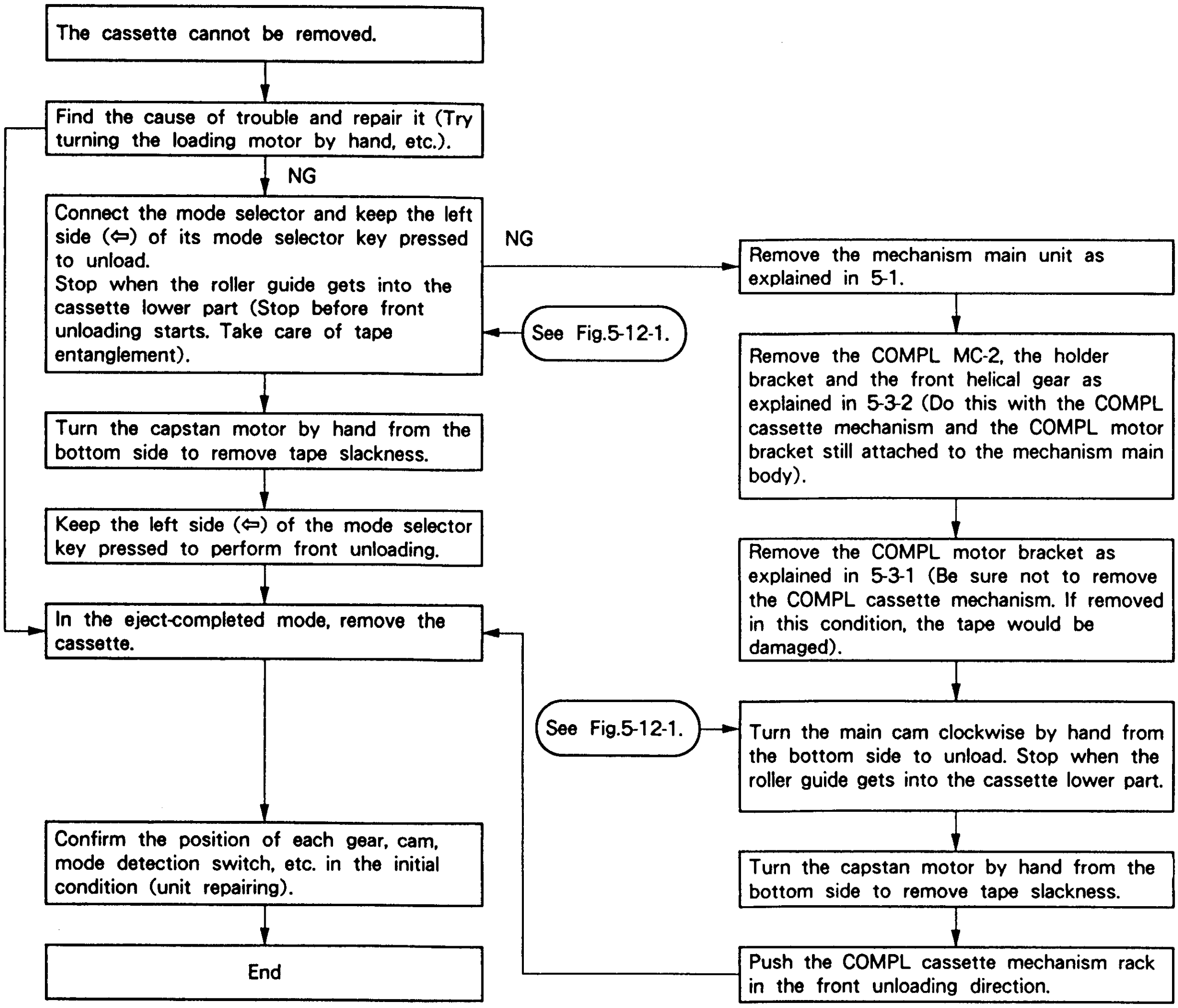

Except 2head normal audio model.
Only 2head normal audio model
Round Hole (SP CH-1 side)
Holes for fixing screw
Rotary erase head's lead wire (Model for flying erase capability)
Round Hole (SP CH-1 side)
Holes for fixing screw

**Fig. 5-11-8. Lower Drum**

## 5-12. HOW TO PROCEED WHEN THE CASSETTE CANNOT BE REMOVED


The cassette cannot be removed.

Find the cause of trouble and repair it (Try turning the loading motor by hand, etc.).

Connect the mode selector and keep the left side (⇦) of its mode selector key pressed to unload.
Stop when the roller guide gets into the cassette lower part (Stop before front unloading starts. Take care of tape entanglement).

Turn the capstan motor by hand from the bottom side to remove tape slackness.

Keep the left side (⇦) of the mode selector key pressed to perform front unloading.

In the eject-completed mode, remove the cassette.

Confirm the position of each gear, cam, mode detection switch, etc. in the initial condition (unit repairing).

End

Remove the mechanism main unit as explained in 5-1.

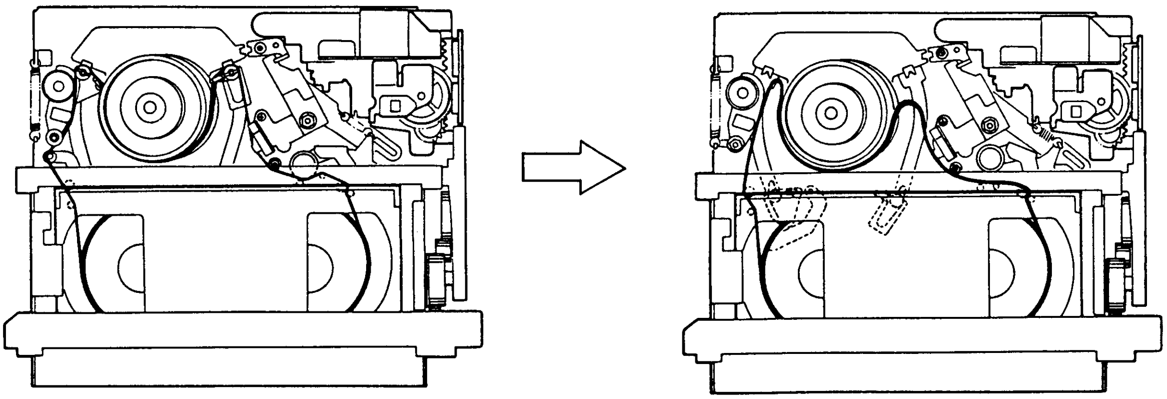
Remove the COMPL MC-2, the holder bracket and the front helical gear as explained in 5-3-2 (Do this with the COMPL cassette mechanism and the COMPL motor bracket still attached to the mechanism main body).

Remove the COMPL motor bracket as explained in 5-3-1 (Be sure not to remove the COMPL cassette mechanism. If removed in this condition, the tape would be damaged).

Turn the main cam clockwise by hand from the bottom side to unload. Stop when the roller guide gets into the cassette lower part.

Turn the capstan motor by hand from the bottom side to remove tape slackness.

Push the COMPL cassette mechanism rack in the front unloading direction.


Before unloading

After unloading

Perform unloading using the mode selector.

First rotate the capstan motor by hand from the bottom to take-up the tape slack, and perform front-unloading using the mode selector.

Fig. 5-12-1

# 6. MECHANISM ADJUSTMENT

## 6-1. OPERATING THE MECHANISM WITH NO CASSETTE INSERTED (See Fig. 6-1-1.)

1) Attach black vinyl tape to the T. END and T. TOP sensors to prevent light from entering.
2) Push the TRAY LOCK LEVER in the direction of the arrow to maintain the unlocked condition. Release the lever just before the TRAY starts moving down.
3) In this condition, operation is possible in every mode. However, the following procedures are necessary to operate the unit in the REC, REW and R-SEARCH modes.

REC mode : Push the SAFETY SW LEVER to turn the SAFETY SWITCH (Erasure Prevention Switch) ON, then press the REC button. If the SAFETY SWITCH is not turned ON, the unit will enter the EJECT mode.

REW/R-SEARCH : After pressing the REW button, turn the TAKE-UP REEL ASS'Y by hand. Otherwise, the reel sensor will operate, setting the INITIAL mode after 2 to 3 seconds.

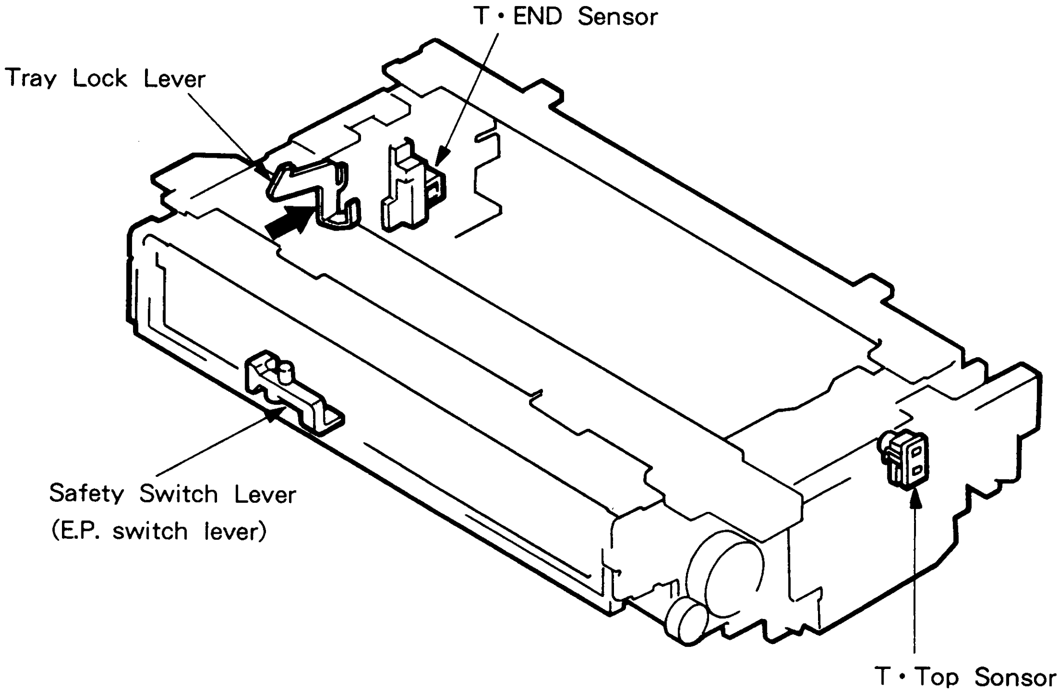


Fig. 6-1-1. Preparations for Adjustment

## 6-2. REEL TABLE HEIGHT ADJUSTMENT AND TORQUE CHECK

### 6-2-1. Reel Table Height (See Fig. 6-2-1.)

If the SUPPLY REEL ASS'Y or the TAKE-UP REEL ASS'Y is replaced, it will be necessary to adjust the REEL TABLE height.

(1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
(2) Attach the cassette stand plate gauge (VHJ-0001) and slide the gauge in the direction of the arrows.
(3) Confirm that, when the gauge stops, the REEL TABLEs are not in contact with surface A of the plate and are in contact with surface B.
(4) If the REEL TABLE is in contact with surface A, remove a spacer and check again.
(5) If the REEL TABLE is not in contact with surface B, add a spacer and check again.
(6) Remove the cassette stand plate gauge.
(7) Set the EJECT mode with the mode selector.
(8) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

**Note :**

- Adjust the reel table height by adding or removing spacers (0.13t, 0.25t, 0.3t, 0.4t and 0.5t) as appropriate so that the height meets the specifications. Use the same method for both the TAKE-UP REEL TABLE and the SUPPLY REEL TABLE.
  (The 0.5t washer is included as the standard washer for the SUPPLY REEL ASS'Y. The 0.4t washer is included as the standard washer for the TAKE-UP REEL ASS'Y.)
- If the height of the reel table is not within the specified value, the tape edge might be damaged as a result, or the tape path adjustment might not be possible to make.

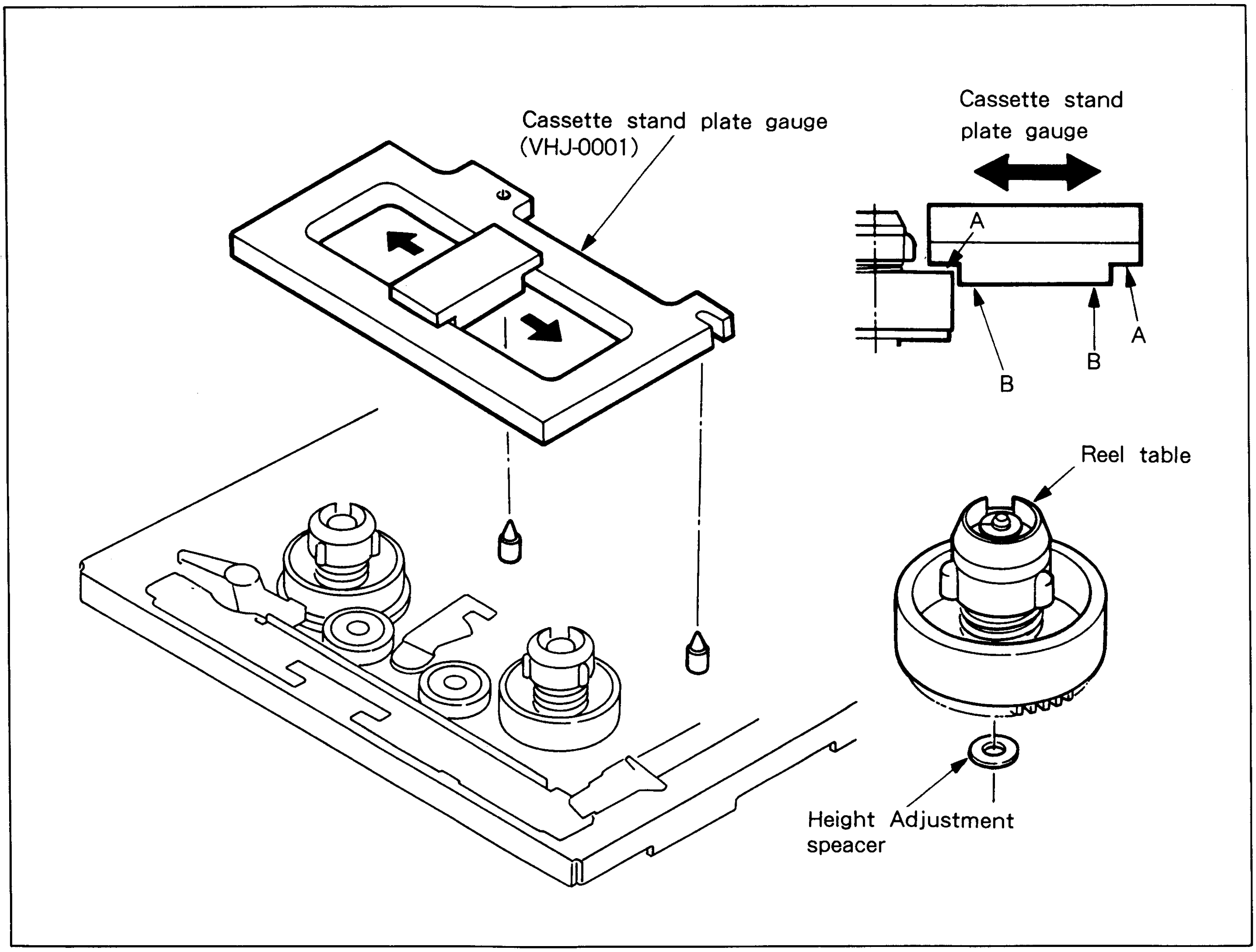


Fig. 6-2-1 . Reel Table Height Adjustment

**6-2-2. Torque Check (See Fig. 6-2-2.)**

1) Set the unit to operating condition without a cassette inserted as instructed in 6-1.
2) Measure the SUPPLY REEL TABLE torque in the REW mode, and confirm that it is 600gcm or more. Perform this measurement keeping the torque gauge in a fixed position with your hand (locked torque).
3) Measure the TAKE-UP REEL TABLE torque in the F.FWD mode, and confirm that it is 600gcm or more (locked torque).
4) Measure the TAKE-UP REEL TABLE torque in the playback mode (SP tape speed), and confirm that it is within 80 through 150gcm (locked torque).
5) After confirming that torque readings are within the specifications for each mode, check the following :
   - ⓐ Dirt on the capstan motor and the REEL PULLEY groove.
   - ⓑ Deterioration of the REEL DRIVE BELT.
   - ⓒ Deterioration of the FRICTION GEAR ASS'Y felt (torque during playback).
   - ⓓ Wear and damage of the COMPL CLUTCH MECHANISM and the reel drive system gears.

**Note :** Items ⓑ, ⓒ and ⓓ require replacement if found defective.

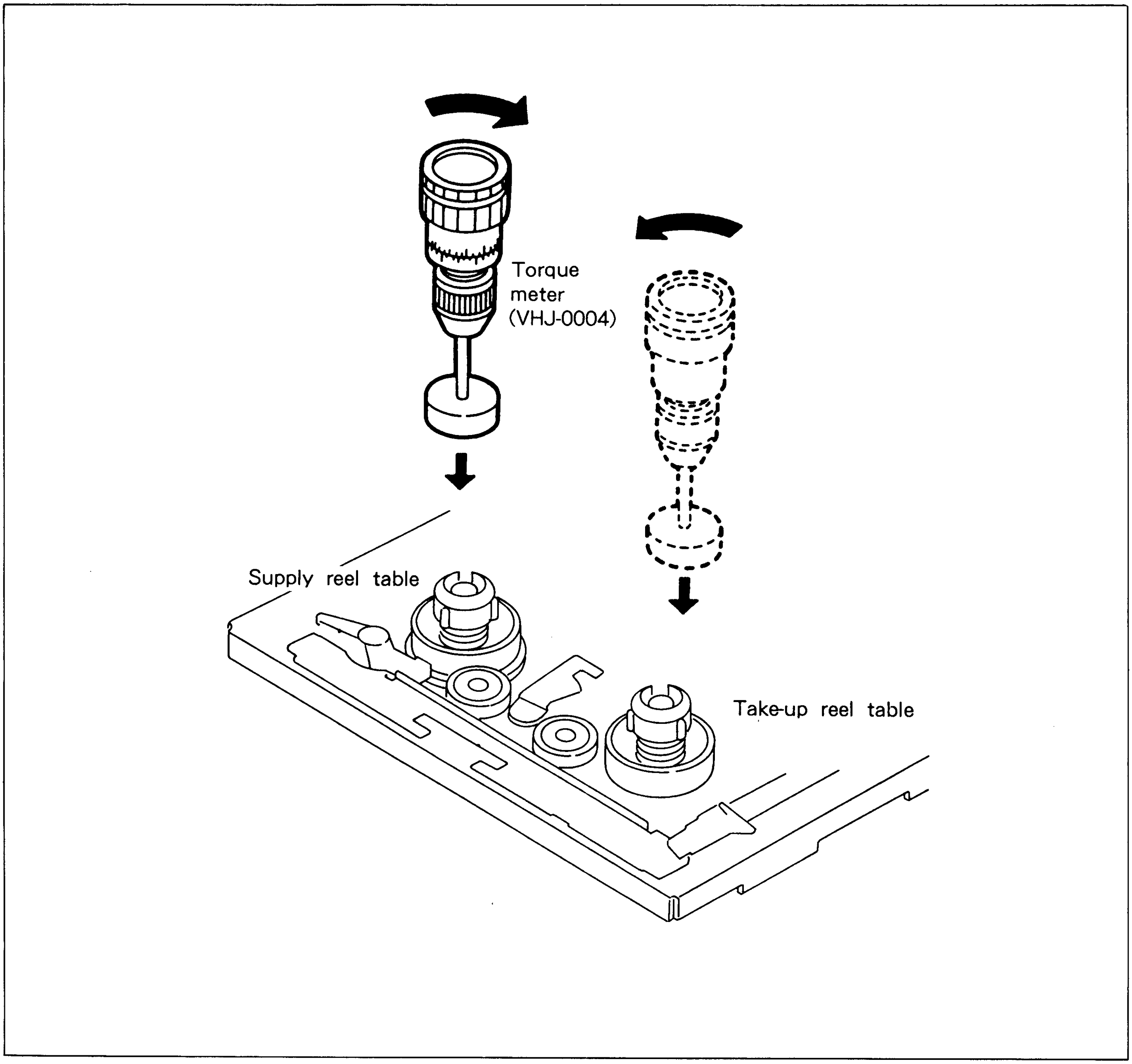


Fig. 6-2-2 Checking REW/FF/PLAY Torque

## 6-3. TENSION POLE (BACK TENSION GUIDE) POSITION ADJUSTMENT AND BACK TENSION TORQUE CHECK

### 6-3-1. Tension Pole (Back Tension Guide) Position Adjustment (See Fig. 6-3-1.)

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Set the PLAY mode with the mode selector (VHJ-0050).
3) Attach the position adjustment gauge (VHJ-0049) ①.
4) Confirm that the tension pole ② is within the position adjustment gauge frame.
5) In case the tension pole is not within the above-mentioned frame, adjust it by loosening the screw ④ a little and changing the mounting position of the BAND HOLDER ⑤ in the direction of the arrow Ⓐ.
6) Remove the position adjustment gauge ①.
7) Set the EJECT mode with the mode selector.
8) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
9) Confirm that back tension torque is within 42 ± 5gcm, as instructed in 6-3-2 below.

### 6-3-2. Back Tension Torque Check (See Fig. 6-3-1.)

1) Attach the cassette torquemeter (VHJ-0016) and set the PLAY mode.
2) Confirm that back tension torque is within 42 ± 5gcm.
3) In case back tension torque does not meet the above specification, proceed as follows :

ⓐ Clean the portion where the brake band (BAND HOLDER ASS'Y) ⑦ of the SUPPLY REEL ASS'Y ⑥ makes contact.

ⓑ Confirm that the brake band of the BAND HOLDER ASS'Y ⑦ does not make wear and that it is clean. If wear or dirt is found, replace the band holder assembly ⑦ as instructed in 5-7-3.

ⓒ Replace the TENSION LEVER ASS'Y SPRING COIL ⑧.

**Note :** Always follow procedures in 6-3-1. Tension Pole Position Adjustment after performing ⓐ, ⓑ and ⓒ.

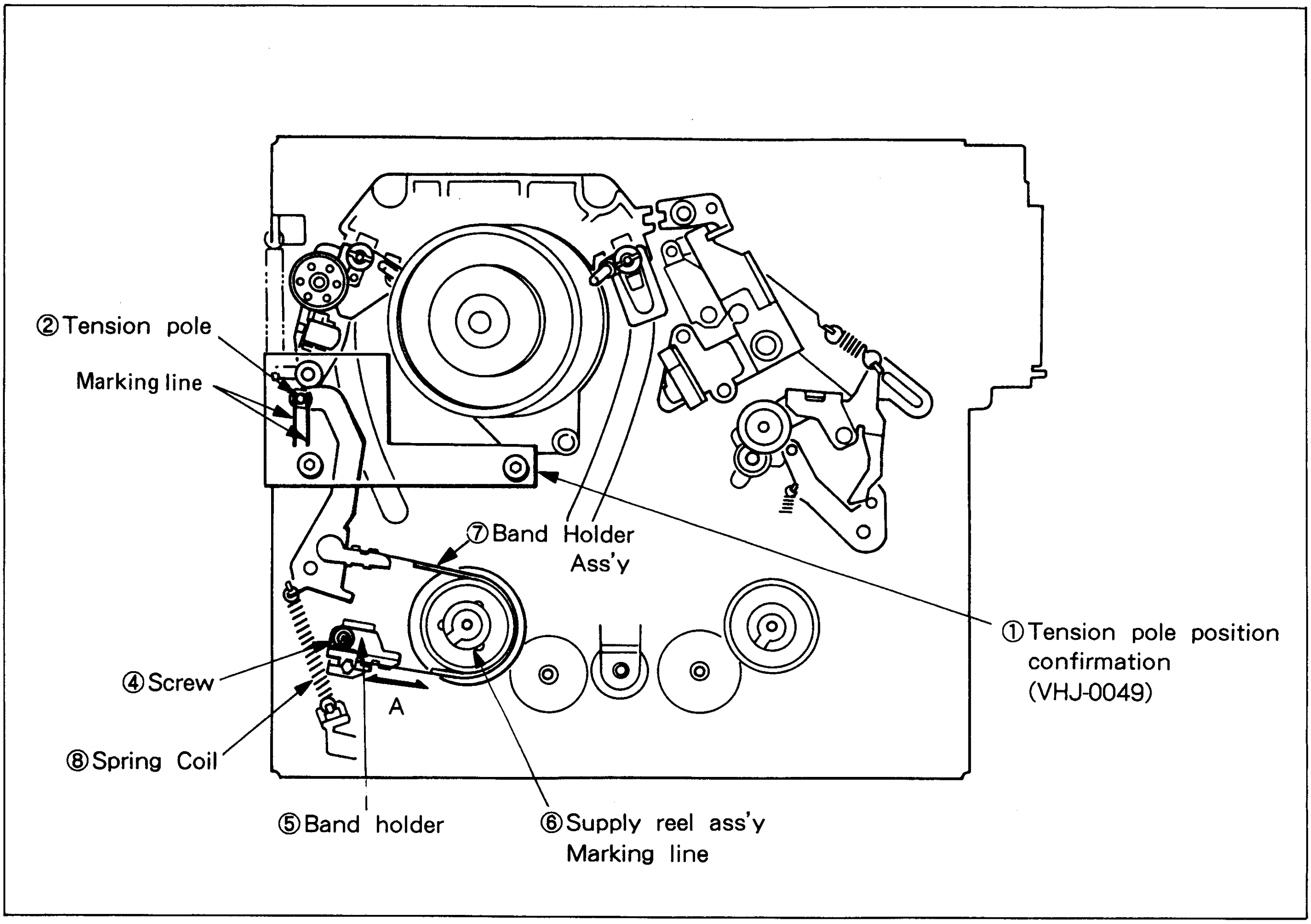


Fig. 6-3-1. Tension Pole Positioning Adjustment

## 6-4. TAPE PATH ADJUSTMENT

The tape path mechanism is precisely adjusted at the factory. Normally no readjustment is required, but checking and/or adjustment is necessary when parts of the tape path mechanism among those shown in the figure below (See Fig. 6-4-1.) have been removed or replaced after a long period of use.
This operation consists of adjusting the various guides so that the tape drawn out from the supply reel runs smoothly along the DRUM (CYLINDER) lead surface. A way of grasping the tape path condition by electronic means is monitoring the video head output envelope waveform with an oscilloscope. However, the fact that visual observation is essential in order to know whether the tape is running through the various guides in a smooth and natural way should be kept in mind when checking and adjusting.
Also remember that the position of tape guides is not greatly affected by the replacement of the UPPER DRUM (UPPER CYLINDER) or the COMPL DRUM (COMPL CYLINDER), provided that it is correctly performed, and that only the replaced parts should be adjusted after replacing a tape guide or COMPL HEAD BRACKET, since the position of the other tape guides shall not change considerably.

### 6-4-1. Preparations for Adjustment

(1) Clean the tape transport surfaces (See Fig. 6-4-1.).
(2) Connect the oscilloscope. Connect the channel 1 probe to the envelope waveform test point, and the channel 2 probe to the RF SW P test point. During adjustment, apply a trigger to the L side of the RF SW P in order to monitor the waveform output from channel 1 of the video head.

**Note :** Since oscilloscope connection points differ according to the model, refer to the "Test Point for Tape Path Adjustment" allocation figure in the electric circuit adjustment section of the service manual book.

(3) Use a dentist's mirror for visual observation of tape path condition.
(4) Use a nut box (VHJ-0048) for adjustment of the fixed guides.
(5) Use an eccentric driver ( VHJ - 0003 ) for adjustment of the guide rollers.
(6) When adjusting height of the fixed guides, guide rollers or COMPL head bracket, turn the special nut or the upper flange clockwise to push the tape downward, and counterclockwise to make the tape rise up.

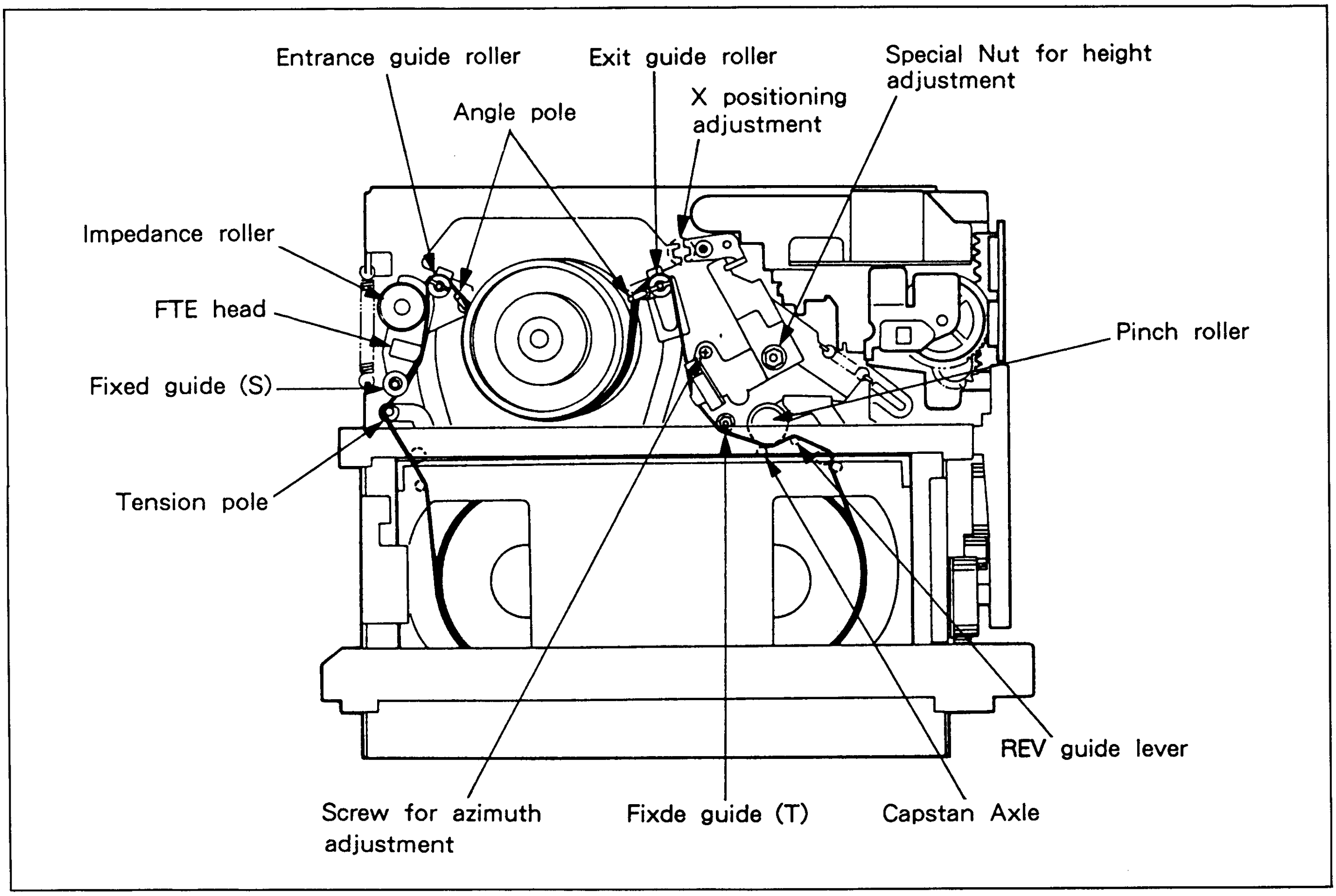

Entrance guide roller
Exit guide roller
Special Nut for height adjustment
Angle pole
X positioning adjustment
Impedance roller
FTE head
Fixed guide (S)
Tension pole
Pinch roller
REV guide lever
Screw for azimuth adjustment
Fixde guide (T)
Capstan Axle

Fig. 6-4-1 Preparation for Adjustment

### 6-4-2. Adjustment by Visual Observation after Guide Roller, Fixed Guide or COMPL Head Bracket Replacement

Perform this adjustment after removing or replacing any of the above parts. Only for the replaced or removed parts, play back an alignment tape (VHJ-0009) beforehand and adjust height by visual observation.

(1) Fixed Guides (See Fig. 6-4-2.)
Adjust so that the tape upper edge does not make contact with the fixed guide upper flange, and the tape lower edge does not make contact with the fixed guide lower flange. Gaps A and B should remain equal.

(2) Guide Rollers (See Fig. 6-4-3.)
The tape should not be curled by the guide roller upper and lower flanges. It should also run smoothly, without moving up and down on the DRUM (CYLINDER) lead surface.

**Note :** An excessive guide roller pressure may cause tape damage.

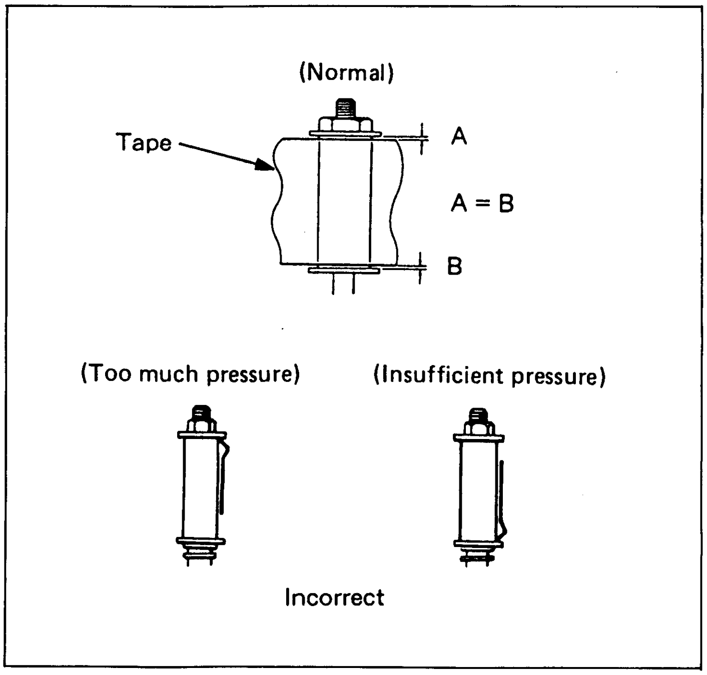

(Normal)
Tape
A
A = B
B
(Too much pressure)
(Insufficient pressure)
Incorrect

Fig. 6-4-2 (1) Pre-set for Fixed Guide

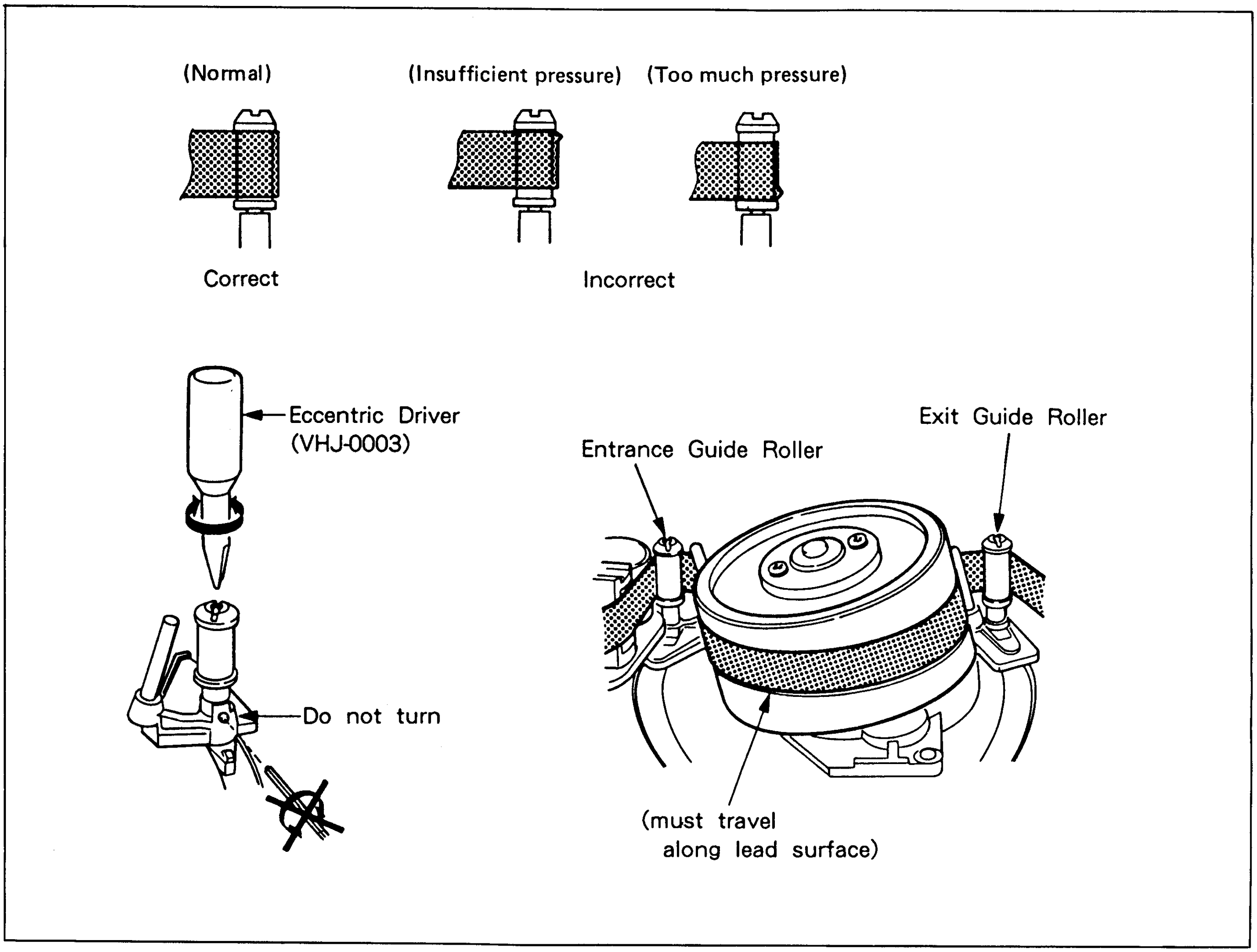

(Normal)
(Insufficient pressure)
(Too much pressure)
Correct
Incorrect
Eccentric Driver
(VHJ-0003)
Do not turn
Entrance Guide Roller
Exit Guide Roller
(must travel
along lead surface)

Fig. 6-4-3 (2) Pre-set for Guide Roller

(3) COMPL Head Bracket (ACE Head) (See Fig. 6-4-4.)
Adjust the special nut so that the tape edge runs between the audio head upper end and the control head lower end. Gaps A and B should be of about the same width. Since at this point it is only required that the control signal is picked up and the servo circuit works normally, no adjusting screws except the COMPL head bracket special nut should be touched.

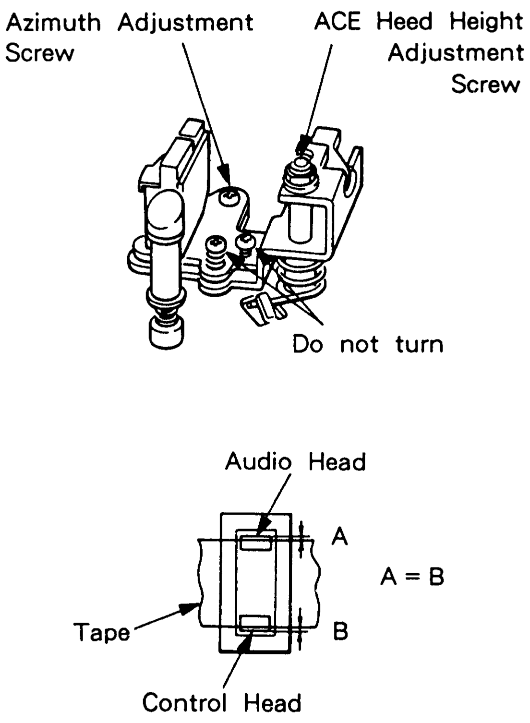


Fig. 6-4-4 (3) Pre-set for Compl Head Bracket

### 6-4-3. Entrance Side Fixed Guide (S) Height Adjustment (See Fig. 6-4-5.)

1) Rotate the fixed guide (S) counterclockwise to lift the tape somewhat, then insert the fixed guide height gauge (VHJ-0053) into the lower side of the fixed guide (S) lower flange.
2) Rotate the fixed guide (S) special nut clockwise a little at a time until the lower flange makes contact with the upper surface of the fixed guide height gauge, causing a slight drag.
3) After rotating the special nut 90° counterclockwise, remove the fixed guide height gauge.
4) After adjusting the guide rollers in section 6-4-2, play back the alignment tape (VHJ-0009). Confirm that the tape lower edge runs in close contact with the fixed guide (S) lower flange. In case too much pressure has left a gap between the tape and the lower flange, or excessive lifting has caused curling of the tape lower edge, perform fine adjustment. However, do not adjust the special nut beyond 90° clockwise and 45° counterclockwise.

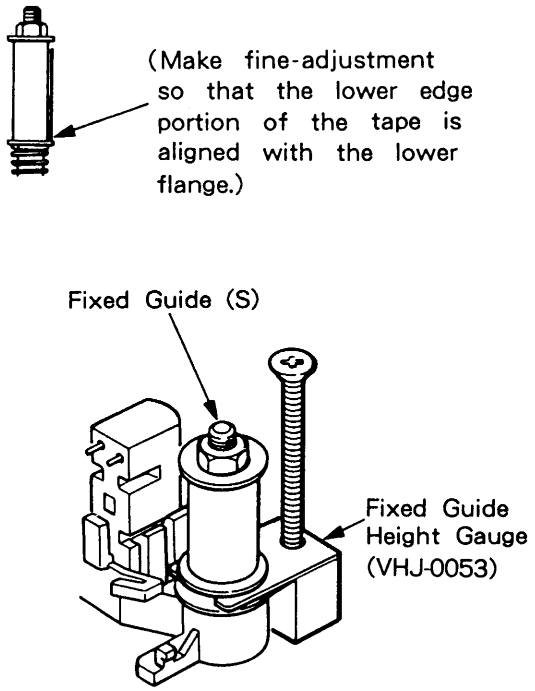

(Make fine-adjustment so that the lower edge portion of the tape is aligned with the lower flange.)

Fig. 6-4-5

### 6-4-4. Guide Roller Adjustment (See Fig. 6-4-6.)

1) Play back the alignment tape (VHJ-0009), press the tracking control key and adjust the envelope waveform to the maximum level.
2) Loosen the entrance and exit guide rollers by rotating them counterclockwise, then rotate them clockwise alternately until they are fastened and a flat video output waveform is obtained.
3) Confirm that the envelope waveform is not deformed, and check visually that no curling occurs at the guide roller upper and lower flanges.
4) Press the tracking control key and set the envelope waveform level to approx. 50% of the maximum. In this condition, confirm whether the envelope waveform is flat. It will not, showing valleys or peaks at the first half (entrance) or second half (exit), if the guide roller pressure is excessive or insufficient.
   In case there is unevenness in the first half (entrance), adjust the entrance side guide roller. If the second half (exit) shows trouble, adjust finely the exit side guide roller.

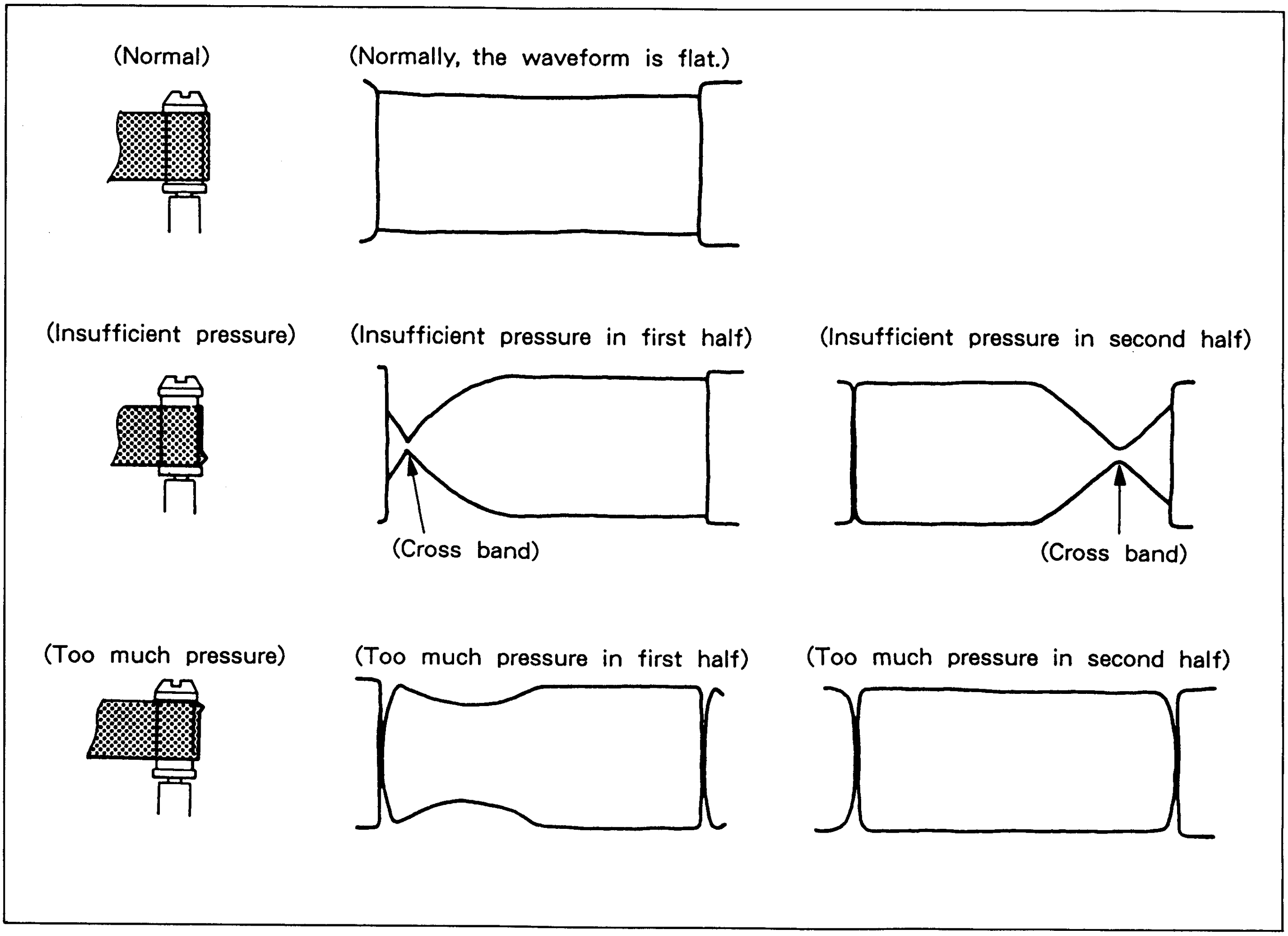

(Normal)
(Normally, the waveform is flat.)
(Insufficient pressure)
(Insufficient pressure in first half)
(Insufficient pressure in second half)
(Cross band)
(Cross band)
(Too much pressure)
(Too much pressure in first half)
(Too much pressure in second half)

Fig. 6-4-6 Guide Roller Adjustment

### 6-4-5. Exit Side Fixed Guide (T) Adjustment (See Fig. 6-4-7.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Rotate the special nut counterclockwise so that the lower flange lifts the tape until its lower edge is slightly curled.
3) Rotate the special nut clockwise a little at a time until curling of the tape lower edge is removed.
4) Confirm at each mode (PLAY, F.SEARCH, R. SEARCH, F.F and REW) that the tape runs along the lower flange and that no curling occurs.

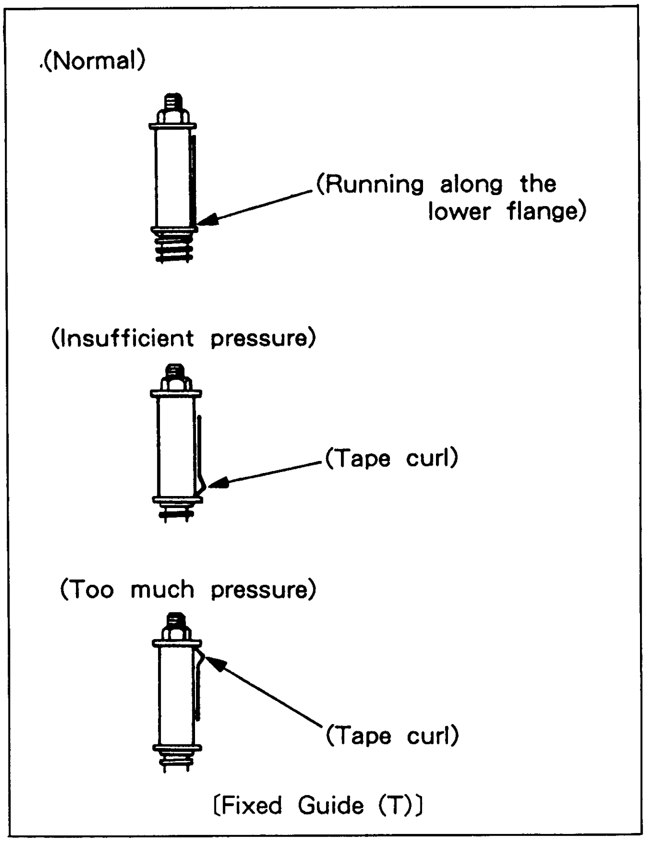

.(Normal)
(Running along the lower flange)
(Insufficient pressure)
(Tape curl)
(Too much pressure)
(Tape curl)
[Fixed Guide (T)]

Fig. 6-4-7

### 6-4-6. COMPL Head Bracket (ACE Head) Adjustment

(1) Height Adjustment and Azimuth Adjustment (See Fig. 6-4-8.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Monitor the audio output waveform with the oscilloscope.
3) Rotate the azimuth adjustment screw until the audio output waveform amplitude is maximum.
4) After loosening the ACE head height adjustment special nut, rotate it slowly clockwise until amplitude of the audio output waveform is maximum, then adjust it finely clockwise to the point just before the said waveform amplitude begins to decrease.
5) Rotate the azimuth adjustment screw until amplitude of the audio output waveform is maximum.
6) Confirm that the audio output waveform amplitude does not fluctuate.

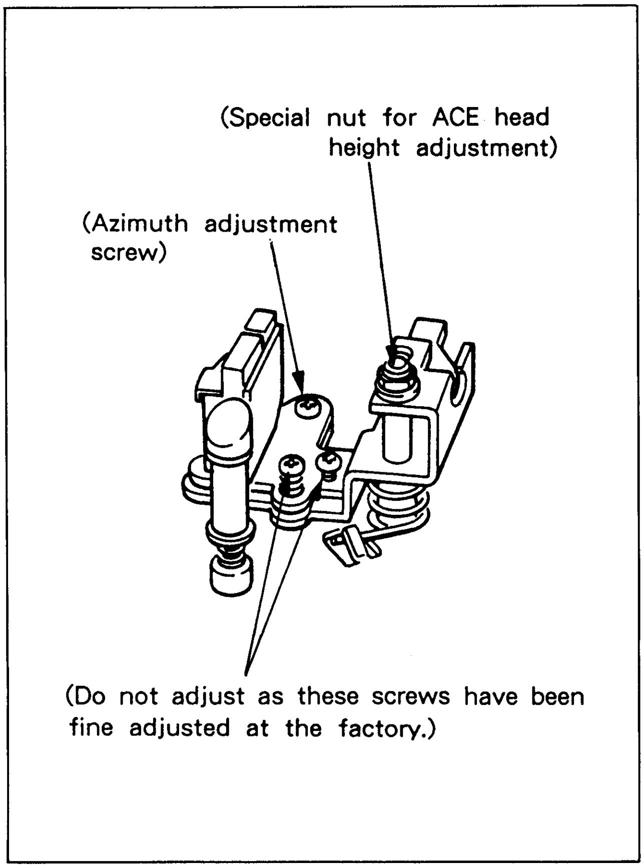

(Special nut for ACE head height adjustment)
(Azimuth adjustment screw)
(Do not adjust as these screws have been fine adjusted at the factory.)

Fig. 6-4-8

(2) Tracking (X Value) Adjustment (See Fig. 6-4-9.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Set tracking to the center position with the tracking control key (See Note below).
3) Rotate the stopper bracket fixing screw 180° counterclockwise.
4) Monitor the video head output envelope waveform with the oscilloscope.
5) Adjust the stopper bracket position so that amplitude of the envelope waveform becomes maximum at the tracking center and the envelope waveform amplitude changes by the same amount when shifting the tracking center by pressing the plus (+) and minus (−) tracking control keys.
6) Tighten the fixing screw.
7) Perform servo circuit channels 1/2 switching position adjustment (refer to Electrical Adjustment).

**Note :** For models equipped with auto tracking, always set to the manual tracking mode before adjustment. To confirm the tracking center position, press the tracking keys (+, −) and observe the front panel clock display. It will read "T − : −" at the tracking center, "T − : , T −  − : " when keeping the minus (−) key pressed, and "T : −, T : −  −" when keeping the plus (+) key pressed. The time indication will be restored 2 to 3 seconds after the tracking keys are released.

**6-4-7. Checking after Adjustment**

1) Play back the alignment tape (VHJ-0009) and confirm that the envelope waveform rise immediately, and that there is no fluctuation in the envelope and audio output waveforms.
2) Load an E-180 cassette, record it and play it back. Then, confirm again that the envelope waveform rise immediately, and that there is no fluctuation in the envelope and audio output waveforms (during recording, input a 1kHz signal to the audio input terminals. Be sure to use an unspoiled E-180 cassette).

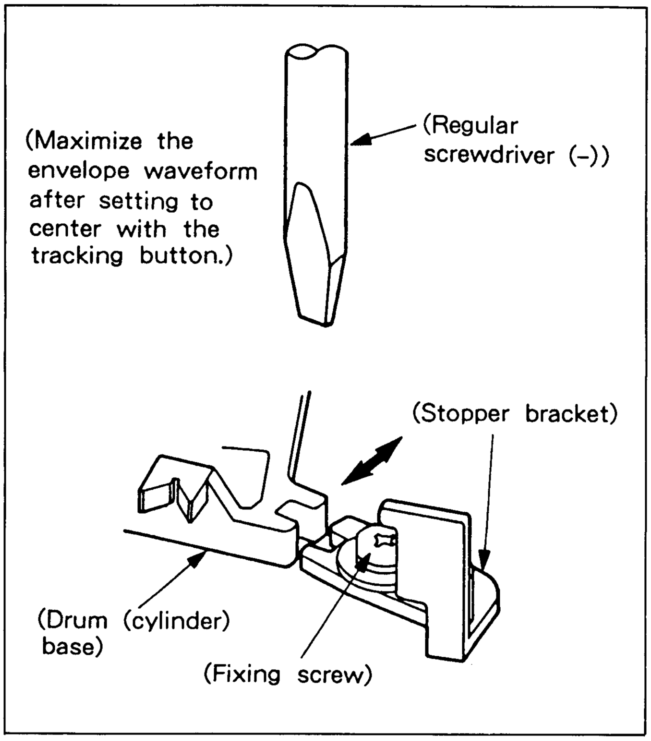

(Maximize the envelope waveform after setting to center with the tracking button.)
(Regular screwdriver (−))
(Stopper bracket)
(Drum (cylinder) base)
(Fixing screw)

Fig. 6-4-9

3) Set the PLAY mode, then turn power OFF (INITIAL mode) and set the PLAY mode again. Confirm that the envelope waveform rise immediately. Also check that the tape is not bent around the pinch rollers.
4) Confirm that the envelope waveform rise immediately, after changing from the FF, REW, F.SEARCH and R.SEARCH modes into PLAY. Also check that the tape is not bent around the pinch rollers.
5) Confirm that no tape curling or sliding-up occurs at the upper and lower flanges of the tape guides in the PLAY, FF, REW, F.SEARCH and R. SEARCH modes.
6) In the PLAY mode, confirm that the tape runs as shown in Fig. 6-4-10.

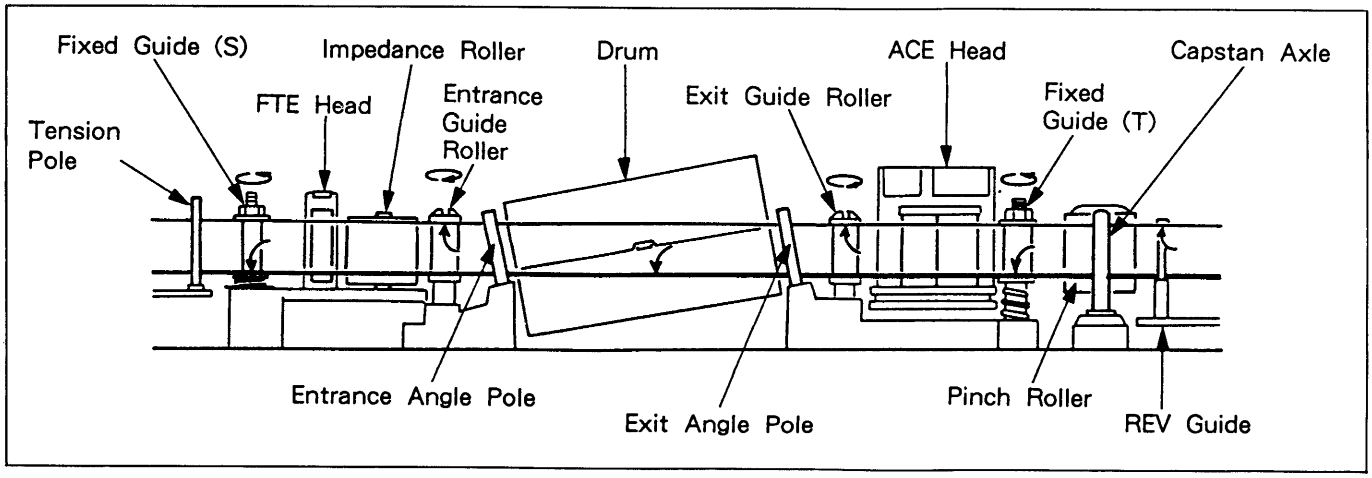

Fixed Guide (S)
Impedance Roller
Drum
ACE Head
Capstan Axle
Tension Pole
FTE Head
Entrance Guide Roller
Exit Guide Roller
Fixed Guide (T)
Entrance Angle Pole
Exit Angle Pole
Pinch Roller
REV Guide

Fig. 6-4-10

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